SCIENTIFIC AMERICAN

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DREDGING AND RECLAIMING LAND IN GLORIETTA BAY, CALIFORNIA.

THORNTON F. HAINES, U. S. ENG. CORPS.

The accompanying illustration shows the Bowers new dredger now at work reclaiming land in Glorietta Bay, near San Diego, Cal. It is another link in the evolution of the hydraulic dredge.

The cutting arrangement is about five feet in diameter, and differs from those heretofore used in that it is worked at an inclined angle, instead of vertically, and that the suction of the pump acts directly between the blades, instead of over them.

The engines are of the non-condensing Westinghouse pattern, of about 300 horse power. There are two horizontal 72-inch locomotive boilers, with 14-foot flues. The pump is a six-foot centrifugal of improved pattern, with an eighteen-inch discharge pipe, and capable of depositing ten yards of material per minute. In soft mud it will dredge about 75 per cent of solid matter. The dredge is swung to and fro with a rotary motion, when at work, a spud at the stern acting as a pintle.

It is very interesting to notice the development of the dredge in the past few years. From the old "dipper dredge," which is still in use for dredging hard material, we see the rapid evolution into the "clam shell." Then came numerous kinds of endless chain dredges, which do splendid work, and these followed finally by the hydraulic dredge, which can deposit from three to five thousand yards of material a day. One of the first dredges of this kind that was a success was the "Von Smith" dredge, several of which are now at work on the reclamation of the Potomac flats, Washington, D. C., and on the improvements at Oakland, Cal.

This dredge does good work in soft mud or sand. The cutting machine is a circular plow, revolved on a vertical axis, and moved from side to side, making a cutting a little over the width of the dredge. The pump acts directly over the plow by means of a hood, and in soft material it can dredge about 50 per cent solid matter. The arrangement of the spuds in the Bowers dredge shows a novel idea for "working forward." The spuds rise on opposite sides of a revolving table. While the dredge is at work the after one acts as the anchor. When the dredge is moved ahead the forward one is dropped, the after one raised, and the table given half a turn.

Grisontite.

The *Chronique Industrielle* states that Mr. E. Muller, of Cologne, has invented a new form of explosive that fulfills two conditions which are essential in practice, but which, up to the present, have scarcely been compatible—efficiency and entire freedom from danger. The uniting of water with an explosive, so as to cool the flames resulting from deflagration, is an old idea, and some of the processes devised to this effect have given good results.

The ingenious idea occurred to Mr. Muller to introduce water into the explosive itself, but in a solid form.

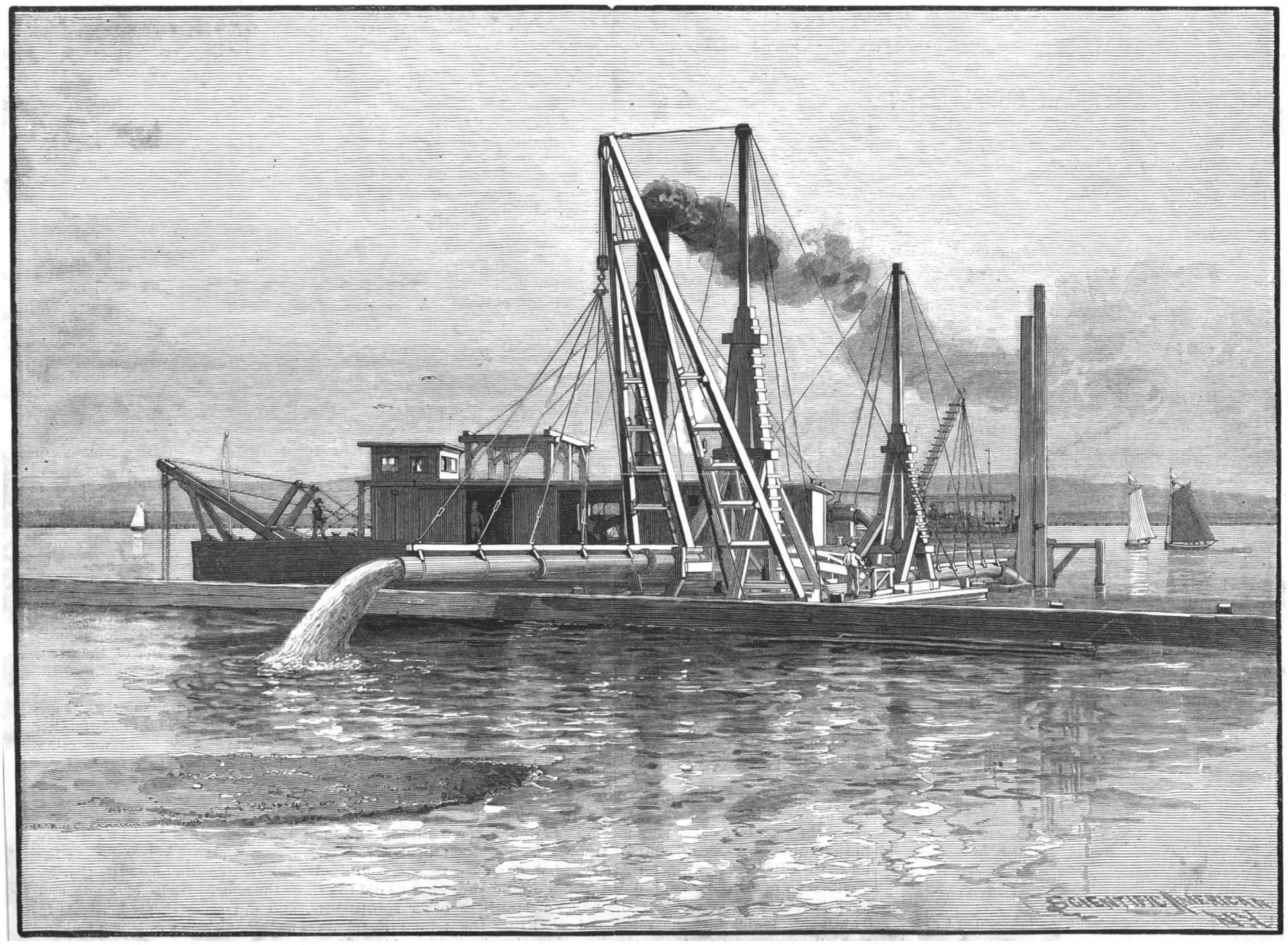
Certain salts, as well known, possess the property of holding in combination, in the state of water of crystallization, a portion of the liquid in which they form and are deposited, the quantity of water varying with the salt. When heated, such salts dissolve in their water of crystallization, and that, too, usually, at quite a low temperature. Upon being further heated, they lose this water very easily, and in most cases without the salt being altered.

With a proper explosive, the inventor incorporates one of such salts in a very finely divided state, and thus obtains a new explosive, which he calls "gum grison" or "grisontite" (from French *grison*, "fire-damp"), in which the proportion of water may be graduated at will by varying the salt or the mixture. The salts best adapted for this purpose are carbonate of soda, which has ten equivalents of water, and sulphate of magnesia, which has seven.

Grisontite with fifty per cent of salt contains, with carbonate of soda, thirty-one per cent of water, and, with sulphate of magnesia, twenty-five and one-half per cent. Numerous experiments made in England and Germany, under the most dangerous conditions of mining practice, have been crowned with entire success.

Mr. Muller's invention is rendered complete by a special apparatus for firing, and by what are called safety matches, these being surrounded by wire gauze, which performs the same office as the wire gauze of a miner's safety lamp. With these matches, there is no danger of setting fire to the gas that may exist in the surrounding atmosphere.

BURLS, used in making veneers with remarkable eccentricities of grain, are excrescences that grow upon various trees, such as the walnut, rosewood, mahogany, oak, and ash. They weigh from 1,000 to 6,000 pounds, and the largest and best come from Persia and Circassia, and cost in the rough from 15 to 40 cents a pound.



DREDGING AND RECLAIMING LAND IN GLORIETTA BAY CALIFORNIA.

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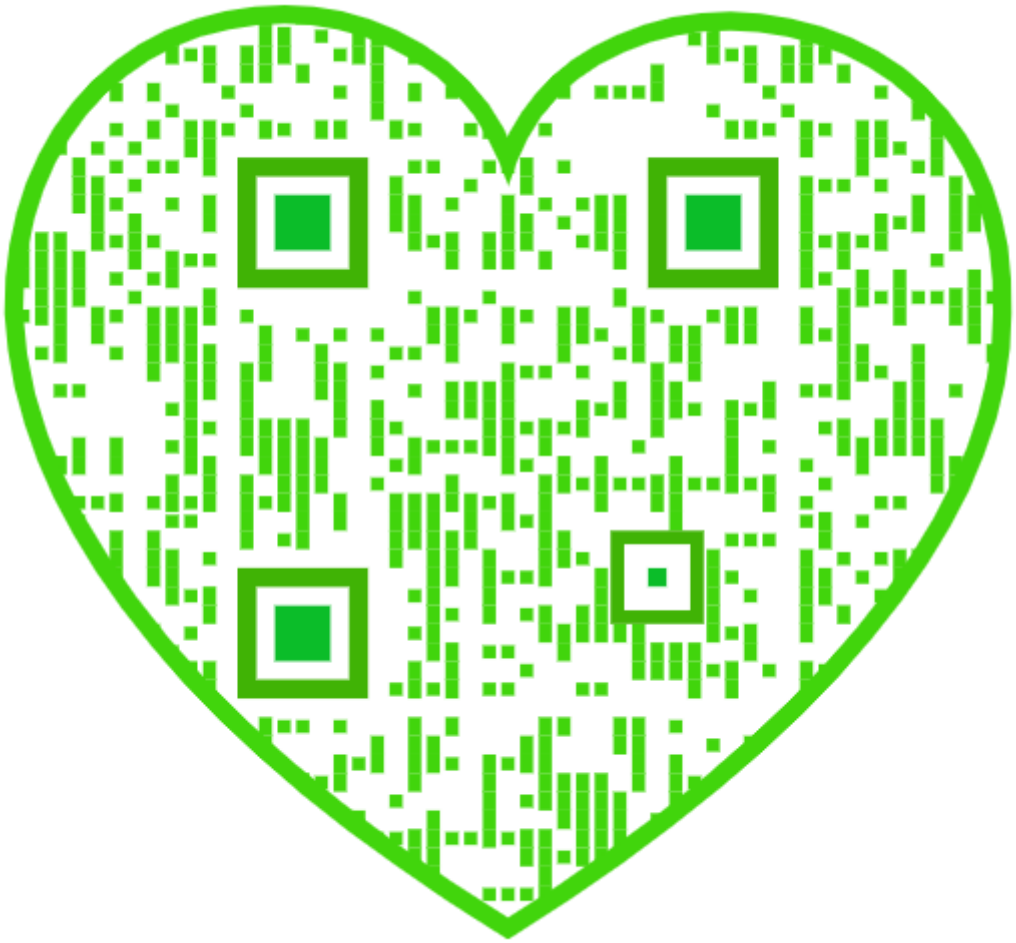

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THE VALKYRIE.

The acceptance by Lord Dunraven of the somewhat modified conditions that are to govern future contests for the America's cup virtually assures an international yacht race in the autumn. To be sure, it is within the range of possibilities that the Royal Yacht Club will not agree to the conditions imposed upon those who may hereafter be the trustees of the cup, in which case all negotiations looking to the race would likely enough cease. But this is improbable. So far both sides have shown a disposition toward accommodation; a sportsman-like spirit seems to have animated the discussion, now happily closed, and even to the most uninterested observer the cup committee of the New York Yacht Club would seem to have conceded all that was prudent, all that was fair, and considering the terms under which the cup was originally entered for and won, far more than could have been fairly demanded. The America sailed against the fleet at Cowes, and two decades later, when the Cambria came over to sail for the lost cup, she, in like manner, sailed against a fleet. In the following year her owner brought over the Livonia, and the New York Yacht Club, to guard against the chances of mishap where so many sail on the same course, selected several schooners to sail against her, reserving the right to select a particular one on the morning of the race. A little reflection will show that this was not, what it has often been called, and what, indeed, at the first blush it seemed, an unfair advantage. For it is conceded that the entire fleet was fairly entitled to sail against the stranger, and these selected schooners, being part of it, would have been in the lists together against her where now, to save sea room, they were pitted singly.

Later on, the better to encourage such contests, a single yacht was selected, thus generously giving up an obvious advantage, for the best boat often has to give way to an inferior because of phenomenal weather, collision, or other mishap.

In the present case there has been a contention that we should bring to the post a yacht of the same dimensions as the challenger, the Valkyrie. If, it was urged, we were bent only upon keeping the cup, with no desire to encourage international yacht racing, this was the safest policy; but that the requirements of manly sport necessitated our giving the stranger a chance to win. If this were so, and yachtsmen of means could yearly be found to build smaller or larger boats, as the variously sized craft from abroad were beaten, a time would perhaps arrive, this theory being carried out to its conclusion, when on the one hand it might be demanded of us to compete against a cockleshell, or upon the other against a four-master schooner of 2,000 tons. It is the history of all racing that the fastest holds the field till beaten. The old American Black Ball clippers to Liverpool, the Indiamen, even the whalers bound to polar seas, crowded on all sail when a stranger came up—stun'sles broadening out and skysails topping royals. No racing skipper ever turned a reef to accommodate a lagging stranger. If he was not long enough or fast enough to keep up, he was expected to lengthen himself out in a ship yard or build anew. He could not expect the champion of the seas to clip his wings. In the present case, should the Volunteer be chosen in the trial race, and this, of course, is likely, she would, even with the handicap, have a great advantage, there can be no doubt of that. The extra length of the Valkyrie, which brings her up to 98 feet, is all overhang. She belongs to the 70 foot class, for a yacht gets her power from her hold on the water, her draught, her beam, and the ballast that gives the power of holding sail.

W. IRVING BISHOP, "MIND READER."

W. Irving Bishop, whose feats in what is called "mind reading" have made him widely known in this country and in Europe, died at a New York City club house in the early morning of May 13, under extraordinary circumstances. There were present many men of some prominence in New York society, and the evening had been passed until a late hour in the social intercourse usual among club men, when Bishop, who was an invited guest, was asked to give an exhibition of his powers, He commenced with what he called an ordinary trick. On his leaving the room, one of the club members took a small dagger and made the motion of stabbing another member, after which the dag was hidden. Bishop was brought in blindfolded, and, with the hand of the man who had hidden the dagger upon his own hand, quickly searched out the dagger, and made a similar motion of stabbing the same man in the way it had been done when he was out of the room.

Bishop then made light of the difficulty of this trick, and proposed to do something more astonishing. He asked the secretary of the club to think of some word in the club's books of account or record. The secretary, with Dr. J. A. Irwin, of this city, who was an acquaintance of Bishop, went down stairs where the books are kept, and selected the name of Margaret Townsend, found in some records, both fixing the word "Townsend" in their mind, and noting just where it appeared; they hid the book and went back up stairs. Bishop, blindfolded, had the secretary's hand placed upon his own, and then led the party down stairs. He found the book without difficulty, turned over the pages rapidly till he came to the page where the name appeared, then, skimming his fingers over it, gradually settled upon the word itself, although he was not then told what the word was. All this had been done while he was blindfolded, and Bishop had been getting into a very excited state.

On being led back up stairs, he proposed to tell what the word was in a manner which would demonstrate that "muscle reading," as it is called, had nothing to do with the performance. He asked all to stand back, and, insisting that the secretary should think intently of the word, stood apparently in a state of half consciousness, the bandage covering his eyes and other parts of his face. Soon he said, "I think it is a name." After further apparently intense mental effort, he exclaimed nervously, "Give me something to write with." Being handed pencil and paper, without an instant's hesitation he wrote, "Townsend," not in natural form, but as the word would appear written on paper and reflected in a mirror. "That is it," he exclaimed, and, as the persons about burst into applause, Bishop stiffened out and sank back unconscious.

Dr. Irwin assured the others that it was only one of the cataleptic fits to which Bishop was frequently subject, and was not dangerous. Bishop was stretched on the floor, and soon, under the care of the doctor, began to show signs of returning consciousness. When he was able to sit up, though apparently only half conscious, the doctor was explaining something of the physical features of the case to those present, stating that the peculiar backward fashion in which the name was written might be accounted for by the fact that the original reflection of everything seen by the eye is inverted as in a mirror, and is reversed by the optic lens on the way to the brain. Bishop, who had apparently heard everything, interrupted the doctor and asked him to make it clear that what was written on the scrap of paper was the exact copy of what appeared in his eye, and was written by him without conscious intervention of the brain.

Bishop was now so excited that the doctor ordered him to be taken to an upstairs room. His pulse was frightfully high, but he so strenuously insisted on doing the trick over again that the doctor finally consented, as affording the best means of quieting him. The book was brought, and Bishop, blindfolded, set out to find the word again. He wandered over the book with great difficulty, but finally hit the right page, found the word, and indicated it by a savage stroke of the pencil across it.

The "mind reader" was now more exhausted and excited than ever, and Dr. Irwin, fearing a nervous collapse, sent for Dr. C. C. Lee to help him. Bishop had frequent spasms, and it was with difficulty that he could be held still. About 4 o'clock in the morning he had another violent cataleptic fit, and went from it into a state of coma, from which he had only moments of half consciousness for two hours, but not a clearly conscious moment from 6 o'clock in the morning until a few minutes past noon, when his pulse and breathing ceased, and he was apparently dead. For fear that it might be only a cataleptic trance, powerful electric currents were applied, and for half an hour some semblance of life was maintained, but at last the current ceased to have any effect, and the doctor said Bishop was unmistakably dead. The body was removed to an undertaking establishment, where, in the afternoon, an autopsy was made by Dr. Irwin and Dr. Ferguson, the pathologist of the New York Hospital.

The suddenness with which this autopsy was made, in the absence of authority from the friends or relatives of the deceased or from the coroner, has caused great feeling in the community. This is heightened by the fact that Bishop, his wife, and his mother, were opposed to any autopsy, and especially desired that in the event of his supposed death at any time the body should be kept as long as possible, for he had frequently been in a state of almost seeming death for a good many hours, as a consequence of these cataleptic fits, as had also his mother.

The autopsy is said to have shown nothing to indicate any cause of death, except the result of the great nervous strain to which Bishop had subjected himself. The brain was a little larger than usual for a man of his size, weighing 40 ounces. The gray matter was unusually dark in color, but there was no malformation or other physical indication that the brain was other than that of an ordinary man. The case is one, however, that is sure to attract wide attention in the medical fraternity, and the controversies about it commenced on the very day the "mind reader" died.

Bishop was born in Boston in 1856, and early obtained a reputation as a "mind reader." Some ten years ago, in England, he attracted much attention by what he did to expose the alleged tricks of Slade and other spiritualists, and did some surprising feats in telling the numbers upon bank notes which he had not seen. About three years ago, in Boston, he successfully discovered a hidden article, to get at which it was

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necessary for him, blindfolded, to drive a team of horses to a carriage a considerable distance through crowded streets—a trick he afteward duplicated in New York City.

To accomplish these feats he always had to be in physical touch of some sort with the person whose mind he pretended to read. Others have pretended to be able to perform the same feats, but it is not known that any feat similar to the one herein described has ever before been performed. Dr. Irwin says he thinks the feat cannot be accounted for upon any theory of known science or medicine.

The Late Allen Thorndike Rice.

Early in the morning of May 16, Allen Thorndike Rice, the editor and proprietor of the *North American Review* and recently appointed Minister to Russia, died. As *litterateur*, editor and politician, he won more than ordinary reputation, and was just entering a new career, that of diplomacy, when he was suddenly called away.

He was born in Boston, January 13, 1853. Five years of his early youth were spent on the continent of Europe with his mother, where he acquired a knowledge of French and German; at the age of fourteen he returned to America, and at eighteen years of age he went to England and entered Christ's College, Oxford. He graduated in four years, and at the age of twenty-two returned to America. His father had meanwhile died, leaving him in possession of a competence. In his college career he had been noted for industry, and the same indefatigable spirit still possessed him. He began writing anonymously for the press, magazines and journals receiving the benefit of his work. In 1877 he purchased the *North American Review*, then in the hands of Osgood & Co. Under their management it had been conducted, it is said, at a considerable loss annually. Mr. Rice at once reorganized it and began editing it on new lines. He designed making it of contemporary interest. The contributions were signed—an important departure from the style of the *Edinburgh Review* and its contemporaries, which in other respects was abandoned.

Authors were selected who were already men of reputation and whose names would operate to sell the *Review*. The success of the new move was immediately perceptible, and it soon began to occupy a new level, and is now said to be earning a profit of considerable amount. These methods, so revolutionary in their relation to the old time reviews, made their impress on the world, and in England the *Nineteenth Century* among others has followed in the new paths of personal journalism. The names of Mr. Rice's contributors cover an astonishingly wide field of literature, science, and professional life of all kinds. His work on the *Review* was very active, and his personal energy was unstintingly given to it. In Paris he had also journalistic interests, owning a controlling share of *Le Matin*. His writings include the introduction to "Reminiscences of Abraham Lincoln," 1886, who died when Mr. Rice was but twelve years old, and contributions to "Ancient Cities of the New World," 1887. He organized the Charnay expedition to Central America and Mexico in 1877. In politics he was a Republican, and ran for Congress in 1886 to be defeated. The funeral was held in Grace Church of this city, the interment in Auburn cemetery, Cambridge, Mass.

The Testing of Glass Vessels.

Those who are in the habit of handling glass vessels will have frequently noticed that colored organic solutions, when long kept in them, alter their color. In this way red litmus becomes in time blue, and solutions of phenolphthalein or hæmatoxylin purple red. These changes are due to the separation of alkali from the glass by the action of water, and in many other cases apparently accidental alteration of the color of chemical preparations may be caused in the same manner. In a paper recently read before the Berlin Chemical Society this subject has been discussed in regard to the determination of the characters of glass for certain technical purposes, and in the first instance it was attempted to effect that object by the use of iodine and starch. As previously shown by the author, F. Mylius, the formation of iodide of starch requires the presence of hydriodic acid or an iodide. Hence the coloration of iodine and starch will take place on the addition of a substance capable of converting iodine into hydriodic acid, and the same effect is produced by the addition of a trace of alkali. Thus, when to a mixture of clear starch solution and iodine solution some very dilute solution of silver acetate is added until the mixture ts rendered colorless, or only yellowish, and then some powdered glass is added, there is an immediate blue coloration.

In this way comparisons may be made with different kinds of glass in regard to their susceptibility to decomposition, but the difficulties attending the application of this method are too great for most purposes. Weber's method of exposing glass to the action of hydrochloric acid gas is also uncertain, except in the hands of very experienced operators. In place of these methods it is proposed to take advantage of the fact that glass is hygroscopic in regard to hydrated ether, and to make the absorption of water, as well as the simultaneous liberation of alkali, perceptible by the use of a material that is colored by alkali. For that purpose eosin has been employed. The alkaline compound of eosin is insoluble in ether, but eosin is soluble; and as the coloration produced by the liberated alkali is equivalent to the quantity liberated, a means is thus afforded of measuring the quality of glass.

In carrying out the operation, the glass vessel to be tested is filled with hydrated ether and some weak eosin solution added. It is then left for twenty-four hours, and at the end of that time washed with ether, when there will be found on the surface of the glass a colored layer of intensity proportionate to the decomposition that has taken place. In all cases the glass vessels must be carefully cleansed beforehand by rinsing with water, alcohol, and ether, and they must while still moist with ether be brought into contact at once with the eosin solution. Some kinds of glass are acted upon by water so rapidly that they are colored immediately by the eosin solution, but with glass of better quality the coloration does not take place until after several hours. The eosin solution for this purpose is to be prepared by dissolving iodoeosin in one thousand parts of water. The application of this method of testing glass has been found very useful in regard to glass instruments of various kinds, and it is considered by the author that in many instances it may prove useful in chemical and physical laboratories, where the quality of glass tubes and vessels is frequently a matter of importance.—*Pharmaceutical Journal.*

Explosives.

Chlorate of potash is the most explosive substance with which chemists and druggists have to deal. By itself it seldom gives rise to serious accidents, but the violence of its character is occasionally shown, and that most frequently and disastrously in the case of colored fireworks. We learn from the report of her Majesty's inspectors of explosives that Dr. Dupré, the chemist to this department, last year had to investigate an accident in Pain's firework factory, arising from the explosion of colored stars. The results are of interest as corroborating previous observations regarding the highly sensitive nature to percussion and friction of chlorate mixtures, particularly at slightly elevated temperatures. The chemicals employed in the manufacture of the stars were found to be chlorates of barium and potassium, nitrate of strontium, shellac, coal, and lampblack. Lampblack is liable to contain an appreciable quantity of free sulphuric acid, but there was none in this case. It was found, however, that one of the ingredients (Chertier's copper) of one of the stars was distinctly acid, and was the cause of the explosion. Chertier's copper is a mixture of chlorate of potassium and sulphate of copper, which has been moistened with ammonia and dried. When freshly made it is alkaline, but in time it loses ammonia, becomes acid, and evolves chlorine compounds, owing to the decomposition of the chlorate of potassium by the sulphate of copper. In other words, Chertier's copper is liable to spontaneous decomposition, and the presence of such a substance in a combustible or explosive mixture cannot but be highly dangerous. It is marvelous how little is required to induce "spontaneous" decomposition in these explosives. Thus the paste used for making pill boxes becomes acid, owing to a change in the alum of the paste, and as no chlorate mixture should ever be brought into contact with materials that are either acid in themselves or are liable to become acid in the course of keeping, it is obvious that the spontaneous ignition of such mixtures kept in these boxes becomes merely a question of time and circumstances. These remarks apply more particularly to fireworks, but pharmacists will do well to keep the facts in mind when they are handling powders or other preparations containing chlorates.—*Chem. and Druggist.*

Alloying and Plating Iron and Other Metals with Aluminum.

The plate or piece of metal to be coated with aluminum is placed in a muffle furnace, which can be heated to 1,000°–1,500° C., and covered with a flux formed of clay or other earth rich in alumina, mixed with sodium chloride, fluorspar, and borax. In the muffle itself, or preferably in another vessel, aluminiferous vapors are produced by heating aluminum chloride or a mixture producing the chloride, and, in the latter case, passed into the muffle furnace. The vapors are mixed with a strongly heated inert gas to prevent condensation and deposition of the aluminum chloride before reaching the muffle; nitrogen obtained by passing air over incandescent coke answers well for the purpose. The aluminum formed permeates the other metal to a greater or lesser extent according to the temperature and time employed. If the outer layer of aluminum be removed, it is found that the mass is still so impregnated with aluminum as to possess practically all the properties of an alloy of that metal.

Iron, steel, or other metal can be alloyed with aluminum which has been reduced directly from its ore in the following manner. The metal is coated over with a mixture of clay or ore rich in aluminum, chloride of sodium, borax, and fluorspar, and then placed in a blast furnace with alternate layers of fuel. The aluminum is readily reduced and combines with the other metal or metals. The alloy formed in the case of iron and aluminum has a low melting point, and can be also produced in an ordinary reverberatory furnace without the use of a blast. The gases issuing from the throat of the furnace are passed through water to retain any products carried off by them.—*L. Q. Brin, Paris, France.*

Securing Foreign Patents.

The *Journal of Useful Invention* contains the following:

The American patent law contains a special provision in favor of the inventor who desires to secure patents in other countries, namely: It provides that after a home patent is allowed, the application may remain in the secret archives of the Patent Office for a period not exceeding six months, thus enabling the inventor to arrange for his foreign patents in advance of all other patents. But if the inventor permits the American patent to issue before he has applied for foreign patents, he loses the opportunity of obtaining them; for in most countries the patent is invalid if previously patented elsewhere. The inventor is thus deprived of the credit and emoluments that he might easily have secured. Many valuable patents have thus been lost to their inventors in European countries. Such is the prestige and fame for ingenuity which Americans enjoy in Europe, that good American inventions are in demand, and if proper steps are taken may be quickly introduced and rendered profitable. The expenses of procuring patents in Europe having been greatly reduced, the obstacle of cost no longer stands seriously in the way of the American patentee. The following schedule shows the best countries in which to take patents:

Countries.	Patent applications (including agents' fees).	Population.
Great Britain and Ireland*	$100	40,000,000
Germany	100	45,000,000
France and its colonies	100	78,000,000
Belgium	100	6,500,000
Spain and its colonies	100	26,000,000
Austria-Hungary	100	38,000,000
Italy	100	30,000,000
Russia and Poland	250	108,000,000
Sweden	100	4,700,000
Norway	100	1,700,000
Portugal and its colonies	400	4,700,000

* Each of the British colonies has its own patent law.

—*Bradstreet's.*

Apprentices.

The *St. Paul Pioneer Press* thinks the apprentice question will not wait much longer for a hearing. The right to earn a living by honest labor is as fundamental as any right can be. But when the trades are hedged about with rules which limit the number of apprentices when the lists are complete, and when the ranks of unskilled labor are full, then the surplus boys are ordered off the earth. There is no place for them, and their only possible chance for existence is in begging or crime. When the trades unions set up their rules limiting the number of apprentices to be taught their trades in any shop, they did it for the purpose of preventing the market being overstocked with skilled labor, and the consequent reduction of wages from an over-supply. But the rule has had no such effects. It has not lessened a whit the number of skilled workingmen. What it has done and all it has done has been to prevent the sons of Americans, both native and adopted, from learning their fathers' trades. It has had the inevitable result of forcing our men, who might be earning from $15 to $30 per week as skilled artisans, to accept salaries of from $5 to $10 as clerks or salesmen or bookkeepers, or, worse than that, to compel them to live a hand-to-mouth sort of a life, doing anything or nothing, as their lack of training to any sort of work rendered imperative. Our workshops have not fewer mechanics in them than if there had never been a rule against apprentices. There was the demand for skilled workmen, and there being not a sufficient supply here, our employers readily got it from abroad. They are constantly getting skilled workmen from over the sea, who come here and take the places which the sons of our workmen should be permitted to take, should, indeed, be welcomed to. That our streets are so full of idle, vicious young and middle-aged men is chiefly due to the extinction of the apprentices in our workshops.

Rats' Tails.

M. Bert sewed the tip of the tail into the back of the rat. After it had taken root in its new position, he cut it off close to its original point of insertion. The rat now wore a tail reversed in position, the former tip being the root. After some time it was found that the new tail was sensitive. Conclusion, the nerves of sensation can carry impulses each way. Dr. Koch has recently performed this experiment on forty rats. In thirty cases the tails united satisfactorily, but never, even eight months later, was any sensation present in the new appendage.

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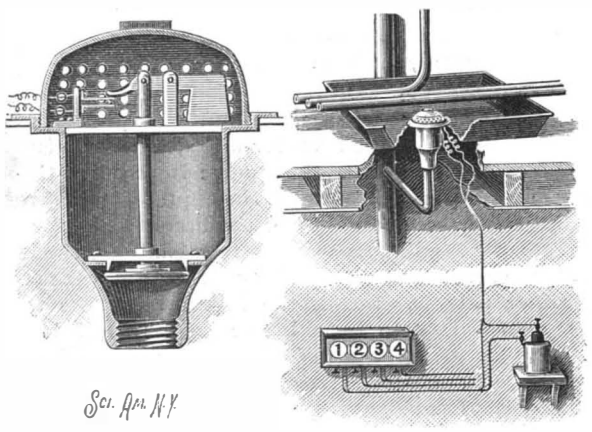
AUTOMATIC LEAK DETECTOR FOR PIPES.

The illustration herewith represents a device especially designed for automatically detecting leaks in pipes in hotels and private houses, and for preventing foul gases from passing from one room or apartment to another by means of the waste pipe. This invention has been patented by Mr. Andrew H. Brown, of No. 229 West Twenty-second Street, New York City, and consists essentially in the employment of a valve held in a closed position until sufficient leak water accumulates on the valve to open it, so that the valve closes an



BROWN'S LEAK DETECTOR FOR PIPES.

electrical circuit connected with an annunciator. The water pipes of a room, or of several rooms, are passed over a drip pan, so that in case of any of them leaking the water will accumulate in the pan, in the bottom of which is held a head provided with a strainer on its top and in the pan. The head is connected at its lower end with a pipe, terminating preferably a short distance above the cellar floor. In the head, as shown in the sectional view at the left, is held an apertured partition, which forms a valve seat for a valve held on the under side of the partition, and secured on a stem passing upward through a bridge. This valve is pivotally connected to a lever fulcrumed on a suitable post. This lever plays in a saddle, and is provided with an insulated contact point adapted to be thrown in contact with a set screw screwing in the saddle, the two points being connected by wires with an annunciator. When a pipe in one of the rooms leaks, and sufficient water accumulates in the head on top of the valve, the latter, in opening, establishes an electric circuit by the wires with the annunciator, giving an alarm to attract the attention of the janitor or other person in charge of the building.

IMPROVED HATCHWAY CLOSING DEVICE.

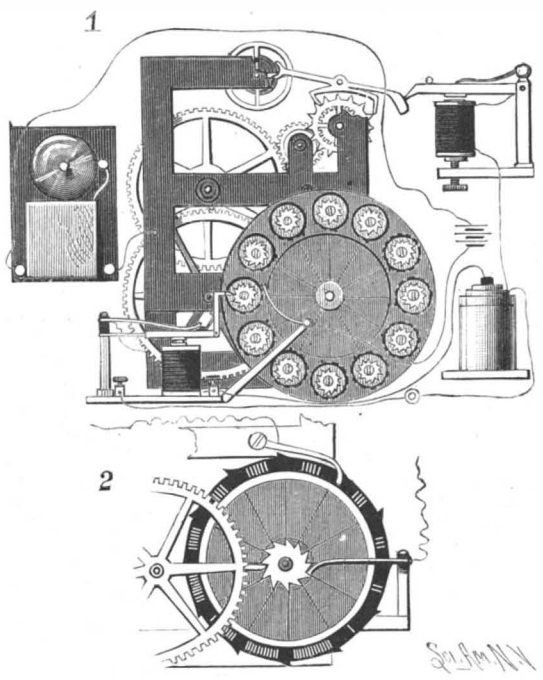
The accompanying illustration represents the floors of a building provided with devices for closing the stair and elevator hatchways to cut off draught communication between the different floors, so that in case of fire its rapid spreading will be prevented. The invention has been patented by Mr. John P. Ketteringham, of 519 South Canal Street, Natchez, Miss., and the construction is designed to be readily applied to existing buildings, and to secure greater simplicity and efficiency than has heretofore been generally attained.

The stair and elevator hatchways are in vertical alignment, extending through the different floors, the stair hatchways being located in the hallways at one side of each floor, and the elevator hatchways at the opposite side of each floor, and to the ceiling around each of them is secured a rectangular frame, preferably of iron.

The side plates of each frame have inwardly projecting guide rails on their lower edges, straight bars sliding thereon carrying blocks on which are fixed the ends of a door section, working in close relation to the ceiling, the arrangement being such that on sliding the connected bars each door section will cover one-half of the hatchway. Upper and lower rack bars are adapted to move each door section to open or close the doors by means of pinions on a shaft mounted transversely in bearings in the side plates of the frame around the hatchway. On the outer projecting ends of these shafts, on all the stories of the building, are bevel gears connected with a single operating shaft extending vertically through the several stories. The gears on the vertical shaft also engage bevel gears on the ends of short horizontal shafts, each of which is journaled in a hanger dependent from the ceiling, these horizontal shafts being so connected that on properly turning the vertical shaft all the hatchways can be either closed or opened simultaneously at will, or any of the hatchway doors can be thrown out of gear so as not to be operated with the others. The main vertical shaft is formed in sections corresponding to the several floors, and joined at each floor by detachable couplings, so that on disconnecting the proper couplings the hatchway doors on any of the floors may be operated without affecting the others. There is nothing about this construction that will burn, it is designed to be readily put in place without damage to the floors and ceilings or flooring of buildings in adjusting it to structures already completed, and can be built at a moderate cost, considering the great advantages it is intended to present.

AN ELECTRIC STRIKING AND REPEATING CLOCK.

The accompanying illustration represents a clock in which both the time movement and striking movement are operated by electricity, while the repeating mechanism can be used separately from the clock. This invention has been patented by Messrs. Alphonse M. J. Jansen and Vincent J. A. M. Jansen, of San Willibrordo, Curacoa. Fig. 1 is a side elevation of this clock, and Fig. 2 a vertical transverse section, with the repeating mechanism omitted. Combined with an impulse wheel and pallets is a lever operated by an electromagnet and adapted to propel the impulse wheel, while in connection with the time movement is a strike wheel arranged to be moved intermittently, the wheel being provided with electrical contacts for completing the bell circuit. Arranged in connection with the strike wheel and its actuating mechanism is a wheel carrying a series of repeating wheels, one for each hour, the repeating wheels being constructed to make as



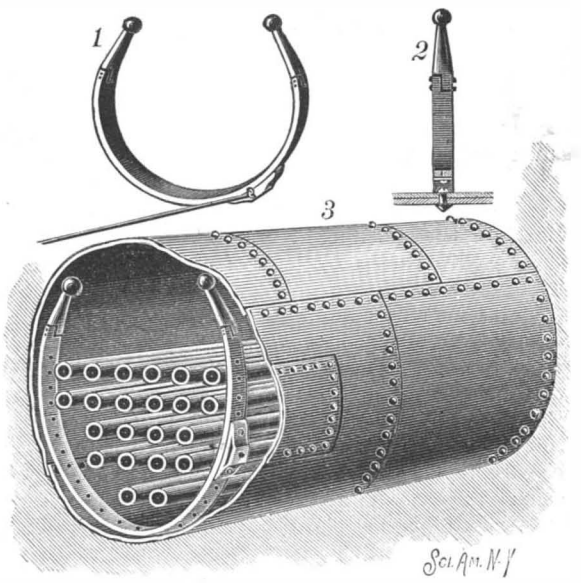
JANSEN & JANSEN'S ELECTRIC STRIKING AND REPEATING CLOCK.

many electrical contacts during every revolution as are necessary to make the stroke for the hour. One or more bells may be connected with the repeating part of the clock, and one or more push buttons with suitable circuit may be provided, so that the clock may be made to repeat at distant points.

Further information relative to this invention may be obtained of Mr. John M. De Pool, of No. 62 Broad Street, New York City, or of Mr. Vincent Jansen, Curacoa, Dutch West Indies.

A RIVET HOLDING TOOL FOR BOILERS.

The tool herewith represented is intended to facilitate the patching of a boiler, hitherto difficult on account of the inaccessibility of the rivet heads by reason of the flues, as to properly fasten the rivets it was some-



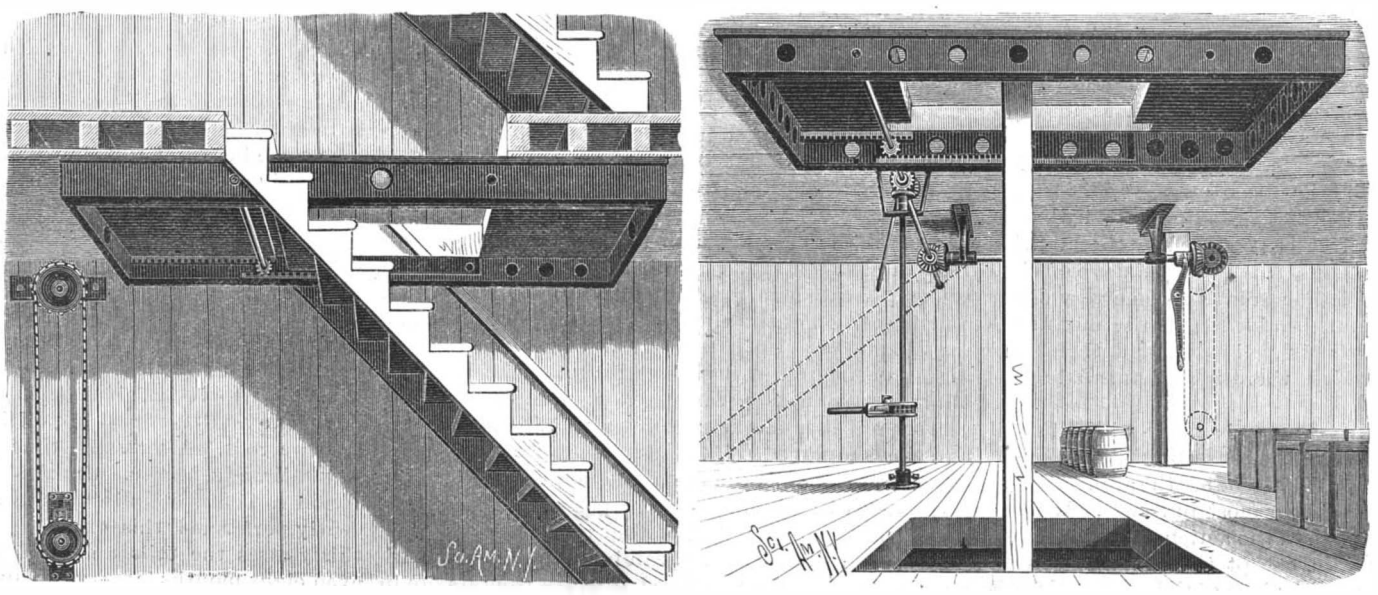
WEIDEMEYER'S RIVET HOLDING DEVICE.

times necessary to remove some of the flues. This invention has been patented by Mr. John P. Weidemeyer, of Coal Grove P. O., Ohio. The tool is made of a curved strip, adapted to extend over the interior circular surface of the boiler, and easily to be passed through the manhole, the strip having handles detachably secured at its ends, as shown in Figs. 1 and 2. A die or plate, having a recess to fit over the head of a rivet, is detachably secured to, and adjustable on, the strip, by means of screws passing through threaded holes on the strip, as shown in Fig. 3, such screws having their heads countersunk in the die. In this way the die may be located in any desired position on the strip to bear against a rivet head, the die being adjusted to the proper position before the tool is introduced into the boiler. The strip, without the handles, is passed through the manhole and moved under the flues to bring the die in engagement with a rivet head, when the handles are attached to the strip and held by a man in the boiler while the rivet is being secured. Where a rivet in the bottom of the boiler is out of sight, the die may be quickly guided to the rivet by means of a rod having a hooked end, engaging an eye in the side of the die, as shown in Fig. 1. In some cases the tool may be found advantageous without detachable handles, and with a permanently fixed die or anvil, when the tool can be slipped around inside of the boiler a short distance without necessitating the removal of the die.

Learning to Think.

In every-day life no fact is more noticeable than the inability of many persons to do their own thinking, even in matters and upon lines wholly within the range of their intelligence. They will see a point that is suggested to them, and will at once understand its bearing on some matter in hand, but they do not seem to have the faculty or art of raising points for themselves, and consequently their action is not as intelligent as it might be. If given a rule to work by, they will apply it not only in season but out of season, and will look amazed if one suggests that, under special circumstances, they should have varied their usual procedure. Every employer and overseer of labor knows to what an extent this is the case. It is the exceptional workman who really thinks, and who can therefore be trusted to suit his action to circumstances. And so in nearly every sphere of life, a kind of automatism seems to be the rule, and intelligent self-direction, in the light of present facts, more or less the exception. One is, therefore, tempted to ask whether in connection with our system of education some gymnastic might not be devised for the special purpose of teaching the rising generation to think. — *Popular Science.*

SALT will curdle new milk; in preparing porridge, gravies, etc., salt should not be added until the dish is prepared.



KETTERINGHAM'S HATCHWAY CLOSING DEVICE FOR STAIR AND ELEVATOR SHAFTS.

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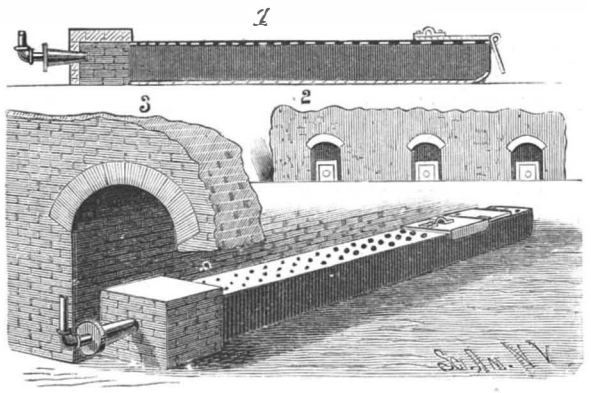
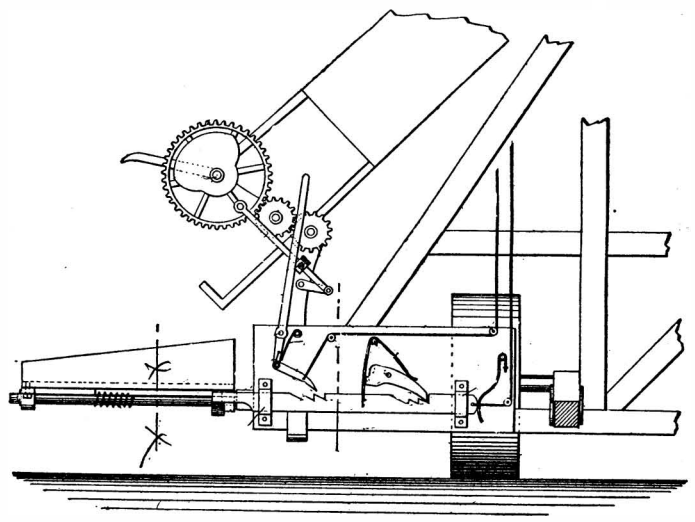
DRYING ATTACHMENT FOR BRICK KILNS.

The illustration herewith represents a drying attachment whereby heat may be distributed from an oil or gas burner through the arches of a green brick kiln, so that the bottom bricks will not "pop" before being heated to a red or white heat, and whereby the heat may be conveniently shut off from any given tier of bricks when desired. This invention has been patented by Mr. Palmer J. Gurnee, of Rondout, N. Y. The kiln has any preferred number of arches, three being shown in Fig. 2, and immediately within the arches at each end is a rectangular chamber, seen in Fig. 3, of



GURNEE'S DRYING ATTACHMENT FOR BRICK KILNS.

fire brick or equivalent material. Metal fire boxes, or heaters, one of which is shown in Fig. 1, are located in each arch, the outer ends of each being inserted in one of the rectangular chambers. The heaters have upon their upper surface graduated apertures, the smallest being at the outer end and the largest at the inner end. A horizontal damper is made to slide by guide flanges upon the upper surface of the heaters, an eye being upon its outer end for inserting a hooked bar for the purpose, while upon the inner end of the damper a gate is hinged. The flame used in heating the kiln is obtained from gas or oil, by means of a burner introduced at the mouth of the arches, and inserted in the



HECKMANN'S BUNDLE CARRIER.

rectangular chamber, the smaller perforations on the upper side of the heaters being nearest the burners. Should the green bricks above commence to pop at any point in the length of the heaters, such surface is immediately covered by drawing the damper over it, and should the popping take place between the approaching ends of the heaters, the dampers are pushed inward until the gate falls down over the inner ends of one or both heaters. The device also prevents back draught from interfering with or extinguishing the flame.

AN IMPROVED REINHOLDER.

The illustration herewith represents a reinholder, or line support for harness when the lines are not in use,

ADAMS' REINHOLDER.

which has been patented by Mr. William B. Adams, of Greenfield, Ohio. It is a device ordinarily to be applied to the harness just below the gig saddle, but in some cases may be secured to the saddle itself. It is mainly composed of two metal sections, one of which is stationary and the other movable toward and from the stationary section, these sections being constructed to present two central upright clamping bars between which the lines or reins are entered when required to be held. The movable section is fitted to slide upon a box-like base portion, and is made with a T-shaped slide on the under side of its base moving within a slot in the upper side of the box part. The base portion of the movable section has a finger piece at its outer end for drawing the section out against the tension of a coiled spring arranged within the base, this spring keeping the reinholder closed to clamp the lines when entered between the uprights. This holder can be attached to any harness, and is adapted to the use of hitching strap while driving.

AN IMPROVED BUNDLE CARRIER.

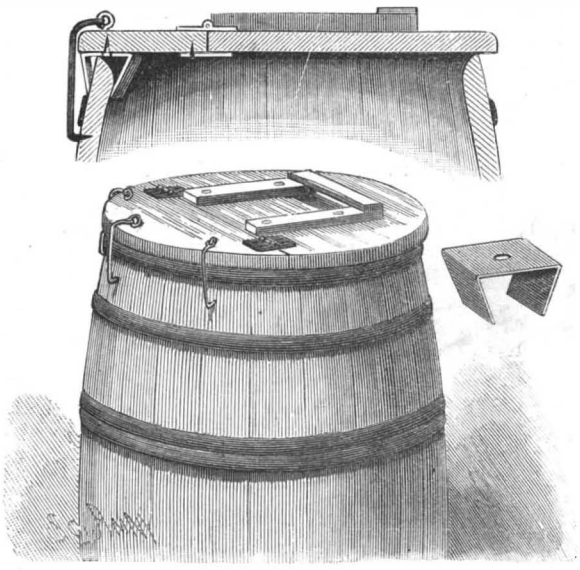
A carrier adapted for attachment to the binder of a harvester, and designed to be automatic in its action, while of simple and durable construction, is illustrated herewith, and has been patented by Mr. Fred Heckmann, of Philothea, Ohio. Our figure shows a front side elevation of a portion of the harvester frame, illustrating the application thereto of the bundle carrier. The harvester frame is supported upon the drive wheel in the usual manner, a part of the binder frame being shown in the upper part of the picture, to the left, while just below is the carrier. The carrier is pivoted at or near its forward end upon a shaft projecting from and rigidly secured to the under side of the harvester frame. It is a tilting bundle carrier having a spring-actuated latch secured to its under side, in connection with a sliding bar engaging the latch, and having an inner and outer group of notches in its upper edge on the inner end, engaged by a pawl and a dog. As each bundle is formed by the binder, which is connected with the carrier from the knotter shaft, the sliding bar of the carrier is carried inward a notch, until three bundles are deposited upon the carrier, which causes the carrier to tilt and deposit the bundles on the ground, and then resume its horizontal position. The carrier may be arranged to receive more than three bundles before its automatic tripping, or the trip mechanism may be manipulated at will by the driver by means of ropes.

AN IMPROVED HAMMOCK SUPPORT.

A hammock support which may be readily mounted in place and horizontally adjusted when in position, and from which the hammock and awning may be readily detached, is shown in the accompanying illustration, and has been patented by Mr. H. E. Collins, of No. 343 Willis Avenue West, Detroit, Mich. It has a curved frame with a central vertical socket on its lower side by means of which it is pivoted on a pin projecting from a plate having a downwardly projecting spike, which may be driven into the ground or other suitable foundation. The upper ends of the curved arms project into vertical sleeves, each provided with a hammock hook. The upper ends of the sleeves are formed integral with a horizontal sleeve or socket, in which rests a tubular bracing rod, by means of which the opposing curved arms of the frame are braced. In order to readily attach and detach an awning, T-shaped brackets are employed, having a sleeve through which passes the supporting rods of the awning, the brackets being attached to the sockets in which the brace rod rests. The brackets may be tilted so as to incline the awning over to one side of the hammock or the other, and a rest for a hat or book, etc., consisting of an open framework, is suspended from the brace rod by hangers, so it can be slid thereon, and placed where desired. By such construction the hammock can be readily set up in any desired location, and quickly removed, and can be adjusted to any horizontal position preferred, while it can be readily taken apart and packed.

AN IMPROVED BARREL COVER.

The illustration herewith represents a hinged cover for attachment to barrels, and one which can be readily attached and detached. The cover is made in two sections connected by hinges, the smaller section being provided on its lower face with two clips, such as shown in the small view to the right. These clips are fastened by a nail or screw to the under part of the cover, and the two ends of the clips are sprung to grip the barrel rim, and hold the cover in position. The same section of the cover is also provided with fastening hooks, secured by a screw eye or staple to its top edge, while the lower ends of the hooks are bent to a point adapted to be driven or forced into the staves of the barrel, the hooks and clips together making a rigid fastening of this section of the cover to the barrel. A dust strip of sheet metal or other suitable material is secured to the lower surface of the cover under the hinged portion. The main section of the cover has two cleats to which a cross piece is attached for a handle,



LINDSEY'S BARREL COVER.

the rear ends of the cleats serving as a stop device when the cover is raised or turned up.

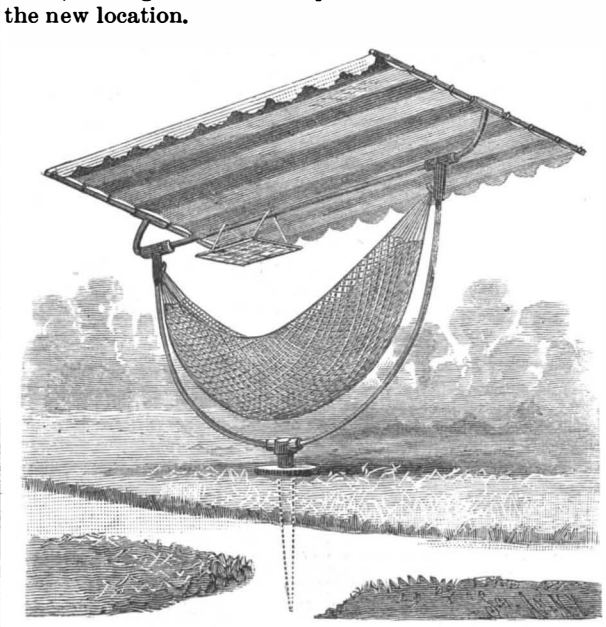
For further information relative to this invention address the inventor, Mr. G. W. Lindsey, Fredericksburg, Va.

AN IMPROVED TRANSPLANTING POT.

The accompanying illustration represents a transplanting pot made in three parts, the body being divisible and the bottom removable. It has been patented by Mr. Jonas Cook, of Mount Pleasant, N. C. The body of the pot is formed with clay or other suitable mate-

COOK'S TRANSPLANTING POT.

rial, in two halves, the edges of which are beveled, to prevent the two parts from sliding one upon the other, while a projection or ear on one half fits into a recess on the other, so as to form a hole, in which is inserted a key to lock the two halves of the body together. The joints on both sides are alike, and the keys are connected with the body by cords. From opposite sides of the lower part of the body project studs adapted for engagement with L-shaped slots in the rim of the bottom, forming a bayonet-joint connection between the body and bottom of the pot. In transplanting, the bottom is removed from the body, the pot inserted in a hole in the ground, and the keys withdrawn, when the halves are pressed laterally apart and raised from the earth, leaving the earth and plants it had contained in the new location.



COLLINS' HAMMOCK SUPPORT.

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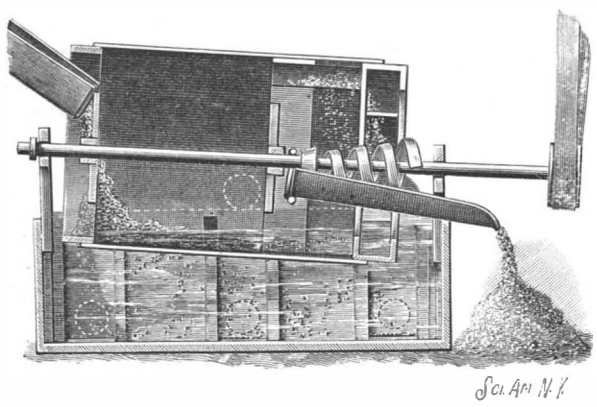
AN IMPROVED GRAVEL SCREEN.

A screen designed to clean gravel economically, cleaning more than can be effected by the dry process in the same time, and which will also clean and save the sand, or clean gravel mixed with clay and loam, is illustrated herewith, and has been patented by Mr. John D. Loughran, of Neosho Falls, Kan. The tank is made preferably with its sides sloping inward to its bottom, and with side outlets near the bottom, each controlled by a slide. Suspended within the tank is an inclined drum screen, mounted on an inclined shaft having its bearings in a frame at each end, the screen having a spider at the end where it is fed, mounted on



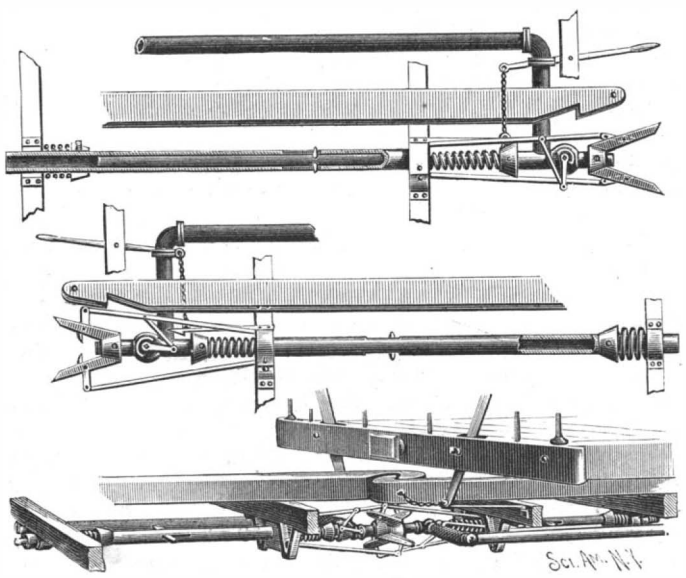
LOUGHRAN'S GRAVEL SCREEN.

the shaft, the arms of the spider extending to a band or ring which supports the screen at that end. A little way from the other end of the screen is another spider and band, also supporting the screen, and two sets of buckets are placed inside the screen at its lower end. Surrounding the shaft at the bucket end of the screen is a worm conveyer, whose feed is outward on to an inclined chute when the screen is in operation. The material to be cleaned is introduced into the higher end of the screen, the tank being filled with water, and the shaft set in motion, when the centrifugal action of the revolving screen soon rids the material within it of the undesired particles. The screened portion will then be fed over the two sets of buckets, by reason of the inclination of the screen, and deposited upon the outwardly inclined chute, whence the conveyer will push it off the chute. It is said that in wire cloth a one-eighth inch mesh is large enough for cleaning gravel perfectly, and that perforated steel can be economically used instead of wire cloth.

IMPROVED HOSE COUPLING FOR RAILWAY CARS.

The accompanying illustration represents devices for automatically uniting the opposing sections of steam or air pipes located beneath the cars of a train when the cars are themselves coupled. The invention has been patented by Mr. Charles N. Burnett, of Clay Center, Kansas. Fig. 1 is a side elevation of the coupling, partially in section, in an uncoupled position, Fig. 2 being a similar view with the parts in the position occupied when coupled, while Fig. 3 is a perspective view showing the coupling heads connected. A jacket is centrally held longitudinally beneath the car and drawhead, in blocks or boxes secured at a certain distance apart to the car frame, the outer end blocks being secured to a yoke-like spring attached at its ends to the car frame, while at one side of the inner box a collar is formed upon the jacket adapted to engage with one end of a spring coiled around the jacket, the other end resting against the box. This spring is designed to offset back or forward motion of the cars while running and when the cars are coupled. The outer end of the jacket is screwed into the outer box and a rod is projected into the jacket, the outer extremity of the rod being screwed into a coupling pipe, the rod being adapted to reciprocate with a limited movement in the jacket. The outer end of the coupling pipe has a conical flange, and a spring is coiled around the rod between the flange and the outer box. The coupling pipe also has a valve and semicircular flange to limit the throw of a lever secured to the stem of the valve. When this lever is thrown downward the valve is closed, as shown in Fig. 1, and when reversed the valve is opened, as seen in Fig. 2. Upon the outer end of the coupling pipe a coupling head is screwed, the heads being inclined at an angle of about 45 degrees, and oppositely on opposing cars, so that they are always in position for coupling at either end. The head consists of a hub recessed to receive a washer and an outwardly extending tubular rubber cushion, and from the hub aligning arms are projected outward, flaring in opposite directions, a longitudinal slot being produced in each. Within the slot are gripping fingers the outer ends of which are pivotally connected to rods leading rearward, and having their inner ends pivoted in the forward box. The uppermost rod is also pivotally connected with the valve lever through a link. To the end boxes is attached a spring latch bar with a head adapted to engage the conical flange on the coupling pipe, to prevent the valves from closing in the pipe should the pipe heads be accidentally uncoupled. The latch bar is connected by a chain with a lever pivoted above the coupler, and representing the ordinary platform lever used upon passenger cars, whereby the latch may be moved horizontally to admit of uncoupling. Communication is established between the coupling pipe and the main steam or air pipe extending beneath the car by a flexible horizontal pipe intersecting the coupling to the rear of the valve. In the event that the hose should be uncoupled by accident, the valves would not entirely close, and the heads would leave each other freely.

For further information relative to this invention, address the patentee, or Mr. H. G. Higinbotham, Clay Center, Kansas.



BURNETT'S HOSE COUPLING FOR RAILWAY CARS.

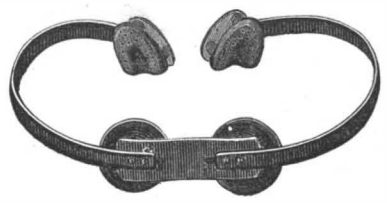
The Standard of Ability.

When a young man starts out to learn his trade and goes into a shop, totally unschooled in the manual performance of his duties in the new field of life on which he is entering, it is important that he should bear in mind this fact, viz.: That his position, so far as it relates to himself, is intrinsically an educational one, as much so as in the school or college from which he may have recently graduated. The simple performance of so many hours' work per day, while it has a certain financial measure of value to the employer, has a value to himself when properly considered that is greater than can be measured in currency. As his progress and standing in the school depended on the thorough mental understanding of each progressive step he took, so, only in a more material sense, his advance in mechanical skill and knowledge is dependent on his thoroughly understanding not only the routine detail of his work, but the why and wherefore of each operation. There always has been and probably always will be two classes of mechanics—those who stand at their bench and go through the manual motions of their work like automatic machines, with little more conception of why the results are as they are; and the other, that class of men who make no moves without knowing why and how results are obtained, and the relative importance of each step. This is the mechanical education that counts, the education that schools the mind to a clear comprehension of principles, equally with details, and leads unfailingly to that higher field where skill, diligence, and marked ability find their natural level. The young man who, on beginning his mechanical education, realizes and acts upon these truths, will develop that ability which is not gauged by mere manual dexterity, but rather that which, when in later years he may be called to design, lay out, and superintend the work of others, will enable him to creditably fill the position. Such positions come to those who bring thought and brains as well as manual dexterity to assist them in their work. To such men we owe the improvements of the age in every branch of mechanics.

It is a fact that too many mechanics work along day after day accomplishing their work by "main strength and foolishness," which is the direct and legitimate result of a lack of proper and thorough application in their earlier mechanical life. The point emphasized is, that the mind that is able, through careful training and application, to bring to bear a knowledge of principles involved, as well as execution of detail in the work, is the one that approaches that standard of ability which should be the aim of every young man who is beginning his mechanical education—his work in the shop. When he has attained this, no question of wages will ever trouble him. Such men are always wanted. The supply is not equal to the demand.—*The Stationary Engineer.*

IMPROVED TRUSS FOR ABDOMINAL RUPTURES.

A simple and inexpensive truss, designed to keep its place when adjusted, and maintain a uniform constant pressure on the rupture, while relieving the spermatic cords and vessels of constricting and injurious strains, is illustrated herewith, and has been patented by Dr. Alexander Dallas, of Bayonne City, N. J. The truss pad has a pressing face provided with a recess or cavity opening to its lower edge, and extending upward along the line of the inguinal canal when the pad is applied, to avoid pressure on the spermatic vessels, the face of the pad at both sides of and above the recess bearing on the ruptured parts, while the lower edge of the pad is inclined to fit the flesh fold between the abdomen and leg. The general pressing face of the pad is concaved transversely of the recess, and there is a back plate adapted for the attachment of fastening straps or belts, with springs interposed between the strap plate and presser plate. It is claimed that this truss marks a decided advance in the mechanical treatment of rupture; that it is anatomically correct, painless in use, and from its shape adapts itself so nicely that no movement of the body displaces it, the pressure being over the internal ring, so that the rupture does not protrude at all, while the groove prevents compression of the spermatic cord and vessels.



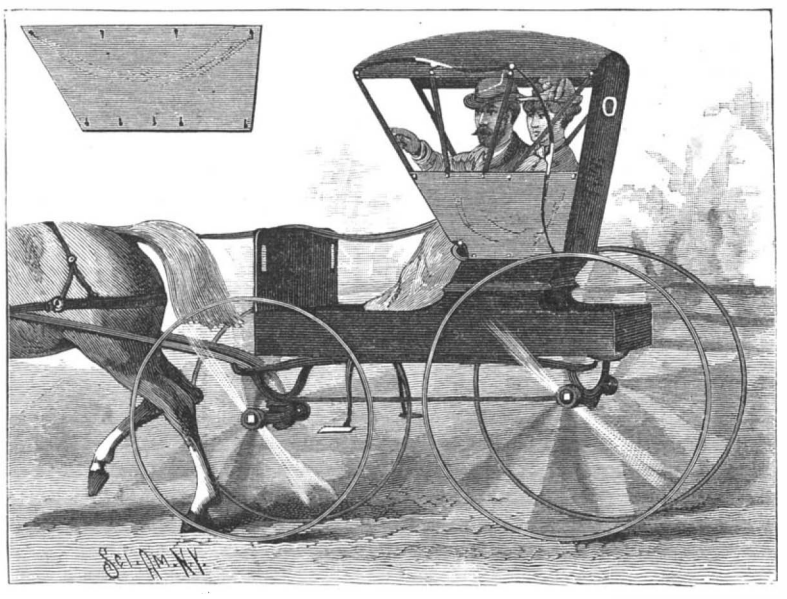
DALLAS' TRUSS.

The New Torpedo Boat.

The Herreshoff Company are building a torpedo boat for the United States government, which is to be 137 ft. long, 14 ft. 6 in. broad, with a depth of hold of 8 ft. Its draught loaded will be 3 ft. 7 in., its displacement under the same conditions is to be 99 tons, and the speed fully equipped is to be 20 knots, though it is stated that the builders expect to get 23. The boat is to be fitted with twin screws and with engines indicating 1,500 horse power. Each engine has five cylinders, having diameters of 11¼ in., 16 in., 22½ in., 22½ in., and 22½ in. The price of the boat is to be $82,750.

AN IMPROVED SIDE CURTAIN FOR BUGGIES.

The illustration herewith represents a sectional side curtain for buggies, so made that either the bottom or top portion, or both, on either or both sides, may be conveniently put up or taken down, as desired. It is a patented invention of Mr. Joseph W. Thomas, of West Side, Iowa. The side curtains may be made of any suitable material, but each is divided intermediately of its height into two different sections or pieces, the division being horizontal and the upper section being preferably made to slightly overlap the lower one. Each of these curtain sections has along its upper and lower margins a series of buttonholes, as shown in the small view, to provide for their attachment by buttons to the buggy top and lower frame, and for buttoning them together or to the bows where the sections meet and overlap in the middle. By this construction, as will readily be seen, the occupants of a carriage are allowed much greater latitude in arranging its side curtains, according to the different conditions of the weather and the roads, than has heretofore been the case.



THOMAS' SIDE CURTAIN FOR BUGGIES.

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Correspondence.

The Double Topsail Rig.

To the Editor of the Scientific American:

Reading the very interesting article in your last issue suggests to my mind that one of the most important inventions of the last half century ought to have been noticed therein. I mean the introduction in the country of what is now known all over the world as the double topsail rig. It must be classed as one of the greatest labor-saving and life-saving devices. I claim not the credit of its invention, for it was known in the northern seas of Europe a hundred years ago, as applied to small vessels, in what are known as topsail schooners. The foremast head, or what is called the doublings of the mast, was longer than usual, and the topsail was set on the heel of the mast and the sail above it was set on the mast above the cap. This was called top-gallant sail; but, in point of fact, *it was a double topsail.* This rig first called my attention to fitting large vessels in a similar manner in the auxiliary steamers Massachusetts and Edith, 1844–45. Not long after I introduced the rig Captain Howes made some changes in the details, and took out a patent and made money out of it, and the old rig is now practically extinct all over the world, except in some naval ships, which are always slow to adopt new devices for lessening labor.

The double topsail rig not only lessens labor and risks to life, but is also a great saving of property, and is admitted by seamen as one of the greatest blessings ever bestowed on the toilers of the sea. I read also what is said in regard to the destroying of floating wrecks, and am glad to see that the Navy Department has ordered a steamer on the duty of destroying them. If we knew of a vessel floating about at sea with lives on board, expeditions would be sent to the rescue. As these derelicts are as dangerous as shoals, or even more so, because they are constantly shifting their position, no pains should be omitted to destroy them.

I recommend the Secretary of the Navy to order all training ships to cruise for them. No more useful work can be done. R. B. FORBES.

Milton, Mass., May 11, 1889.

Lines of Electrical Induction.

Some very pretty experiments may be made, and the lines of electrical induction between two electrified bodies may be shown extremely well, by the use of the fine white needle-like crystals of sulphate of quinine suspended in a good insulating liquid, such as pure turpentine. To perform the experiments, take a flat glass dish and pour in turpentine to the depth of about a quarter of an inch, sprinkle this with sulphate of quinine evenly distributed till the turpentine assumes a milky appearance. If now a brass ball connected by a chain with an electrical machine be placed at one end of the vessel, and another connected with earth at the other end of the vessel, on working the machine the crystals of quinine will become polarized and take up their positions end on end, forming very distinct curved lines between the balls in exactly the same way as iron filings form in lines of magnetic induction when sprinkled over a magnet. The symmetrical lines of white crystals when shown up by a dark background look extremely beautiful. We have here the basis for a set of experiments which may be diversified to an almost unlimited extent by varying the number and shapes of the electrified bodies placed in the turpentine.

The fact that there is no electrical force within a hollow conductor may be very prettily shown by connecting both of the balls in the above experiment with the machine and placing in between them a large metal ring connected with earth. The curved lines are then very distinctly shown running from each ball to the ring, but within the ring the turpentine remains in the uniformly cloudy state in which it was initially, the crystals showing no disposition to place themselves end on end. The difference in the appearance of the quinine particles outside and inside the ring is very striking. If now a small third ball be connected with the machine and placed in the center of the metal ring, the appearance of the turpentine within the ring is entirely changed, and the crystals form in straight radial lines from the center to the circumference.

By multiplying the number of the electrified balls, charging some positively and others negatively, the resulting lines of induction may be made very complicated, but, provided that there is a fair space between the balls, the lines are always distinctly and clearly mapped out by the crystals. It is an easy matter to obtain some very beautiful figures by symmetrical distributions of the electrified bodies.

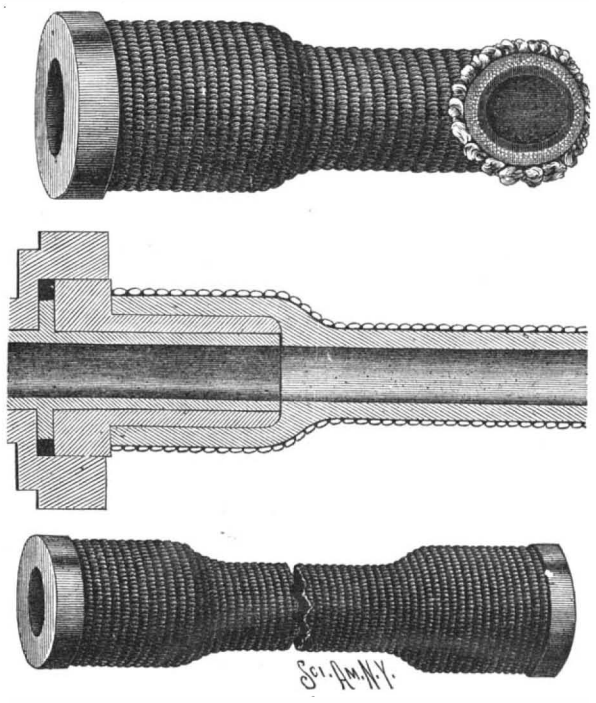
In making the experiments it is very necessary that the turpentine should be pure and dry, as a very slight amount of impurity is sufficient to destroy its powers as an insulating medium. Benzine will answer, and it possesses the additional advantage of not dissolving any of the quinine, while turpentine dissolves it to a slight extent, but its specific gravity is so small that the crystals fall to the bottom of the vessel almost at once, and adhere to it, so that they will not easily take up the lines unless the experimenter be sufficiently quick to electrify the balls before the particles reach the bottom. On the whole, turpentine I have found to give the most satisfactory results. After the crystals have once been electrified inductively in this way, they appear to take up the lines much more easily a second time. It seems as though the molecules do not recover altogether from the effects of the electric strain.

R. W. CHAPMAN, M.A.B.C.E.

The University of Adelaide, South Australia.

AIR BRAKE HOSE.

The illustration herewith presented represents, in section and perspective, a new form of high pressure hose, in which the hose is strengthened at the coupling, where it is ordinarily the weakest. In general, when hose is covered with wire or canvas, the covering stops at or just before the actual couplings, leaving a space that is not protected right where the most wear comes. In this hose the canvas and the woven cover come entirely over the metal parts making the coupling, and a full rubber cushion is made at the terminus of each section, whereby a perfectly air-tight joint can always be made, without friction or wear of the parts. The hose here represented is made stronger than usual, so that it is not likely to kink, the canvas covering being adapted to stand 1,000 pounds pressure, and to hold its inclosed rubber tube entirely tight, while the outside woven cover, which is specially treated, is an additional close, strong, and solid protector, insuring long wear. It is said that this hose has satisfactorily proved its eminent serviceableness by very severe tests. It is made by the



AIR BRAKE HOSE.

Boston Woven Hose Co., also manufacturers of rubber hose and belting and mechanical rubber goods, No. 234 Devonshire Street, Boston.

Some Northwestern Weather.

Dakota is a sort of breeding ground of weather, and it would be strange if occasionally something unique in the atmospheric line were not produced there. The stories that come from there about recent meteorological phenomena show that something of the kind has been prevalent there during the past week.

To begin with, there was a period of two or three weeks without rain. Then the wind arose and blew the soil like snow, so that a dirt storm occurred, which was like a snow storm in appearance, but far worse in its effects. Spring wheat was blown clear out of the ground and whole fields were cleared of their top soil to a depth of several inches. Drifts of sand and dirt occurred in partially sheltered places, which were in some cases three feet deep.

But more remarkable things remain. The atmosphere was so charged with electricity that it was dangerous to touch metallic bodies. An end of barbed wire that had become loose set fire to a field of grass. A cow passing along by a barbed wire fence would sustain a continuous fire of sparks from the barbs that looked in the dark like a fusillade of musketry. In fact, the Territory was pretty nearly in a state of spontaneous electrical combustion.

At last the welcome rain came—a genuine soaking rain—and all the wheat that was not blown out of the ground will grow finely. That which was blown out will come up probably, but it will be on the roofs of houses, in dooryards, in city streets, and on the clothes of persons who got caught in the rain after being out in the dust storm.

There were no forest fires in Dakota, for the very good reason that Dakota has no forests; but the woods in parts of Minnesota, Wisconsin, and Michigan have been afire for some days, and a large amount of property has been destroyed. The rains have now put out some of these fires, but, so far as can be learned from the reports, some of them, in Michigan especially, are still raging, and further damage will be done. These are trying times in the Northwest.—*N. Y. Mail and Express.*

The Poisonous Quality of Respired Air.

MM. Brown-Sequard and D'Arsonval have made a further statement to the Academie des Sciences respecting their discovery of a poisonous principle in water condensed from respired air. New researches, made at the beginning of last year, have shown that this poison, be it simple or multiple, which accompanies expired air, is able in small quantities to kill even without being directly injected into the blood. This toxicity is not due to the presence of microbes in the pulmonary liquid, for the same effects are produced by it after having been subjected to a temperature of 100° C. in a closed vessel. During the past year many experiments have been made to determine the action of the pulmonary poison as it exists in respired air mixed with pure air, the results of which have completely confirmed what has been learnt respecting this poison by other methods. An apparatus has been used for this purpose, which, while showing the poisonous property of respired air, has also permitted it to be demonstrated that the carbonic acid of this air has nothing to do with its toxicity.

The apparatus consists of a series of metallic boxes connected with each other, but shut off from the outer air by sealed joints. An aspirator connected with a gas meter draws a measured current of air through the series of boxes, one after another. It consequently follows that an animal shut up in the first box breathes pure air, while others inclosed in successive boxes must breathe air more and more vitiated. Every care is taken to provide for the drainage of the boxes. It was found that animals shut up in these boxes died sooner or later, according to their distance from the fresh air box, although the proportion of carbonic acid never became more than 2 or 3 per cent of the air which proved most deadly. Pure carbonic acid in the proportion of 20 per cent of the air was breathed by the same animals with impunity. Also when the pulmonary poison was arrested by passing the air containing it through a washing chamber charged with concentrated sulphuric acid, which would not have any effect upon its carbonic acid, the toxic quality disappeared. Hence it may be deduced that the atmosphere of all badly ventilated rooms, occupied by men or warm-blooded animals, is charged with an unknown active poison which would kill all the inmates if they remained long enough under its influence, and even in a short time affects their health.

Headache.

The etiology of many forms of headache is still quite obscure. Dr. A. Haig maintains that one variety of periodic headache is directly due to the retention of uric acid in the system. The usual sequence of events, according to him, is as follows:

There is a time (say seven to ten days) of good general health, active nutrition, and bodily activity, with plus formation of uric acid and urea, and concomitant rise in acidity. As acidity rises, uric acid comes to be retained, and at the end of four or five days several grains may be regarded as stored up in the liver and spleen. Then come dyspepsia, gastro-intestinal catarrh, and hepatic congestion (and Dr. Haig is not by any means certain that this hepatic congestion and gastro-intestinal trouble may not be the direct result of the accumulation of uric acid in the liver and spleen). These quickly result in general diminution of absorption and nutritive changes, with lessened formation of uric acid and urea and a fall in acidity; and lastly, as the result of this falling acidity, there comes a rush of the stored uric acid into the blood, and the headache begins.

Such a sequence may be seen to some extent in the figure that accompanies his paper on headache (*Transactions*, 1887), for there the urea drops from five hundred and sixty-one grains to three hundred and sixty-three grains in the four days that immediately precede the headache. Although acidity was not estimated in this instance, there can be no doubt that it followed and shared in the fall of urea to a large extent. Such a sequence explains the periodicity of this kind of headache, and the way in which it comes to occur every week or ten days for many years, varying only in degree with the corresponding variations in nutrition. It is also evident that any causes which affect digestion will influence the attack in one of the above ways; while all causes of debility, by weakening the nerve center on which the uric acid acts, will render it more sensitive (the reverse of the action of bromides) and the attacks more frequent. A knowledge of these facts gives him almost complete power either to cause or cure this headache in himself and other sufferers.

The good effects of salicylic acid, and the salicylates generally, in this variety of headache, are due to the circumstance that they facilitate the excretion of uric acid, and thus prevent the retention of excessive amounts within the body.—*Medical Record.*

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THE FRENCH WAR SHIP AMIRAL BAUDIN.

The armor-plated ship Formidable, built at Lorient, left that port, at the beginning of the year, for Toulon, where the final tests of her were made, and she is shortly to be put in service. This vessel is the mate of the Amiral Baudin, which forms part of our squadron, so that the picture of the last named, given herewith, portrays at the same time the new armorclad which is to increase the power of our fleet.

These two ships are the largest of the vessels that we have afloat, and may be compared with those that rank as first class in other navies. The following are their principal dimensions: Maximum length, 343 feet; extreme breadth, 69½ feet; depth, 40½ feet; mean draught, 26 feet; displacement, 11,400 tons.

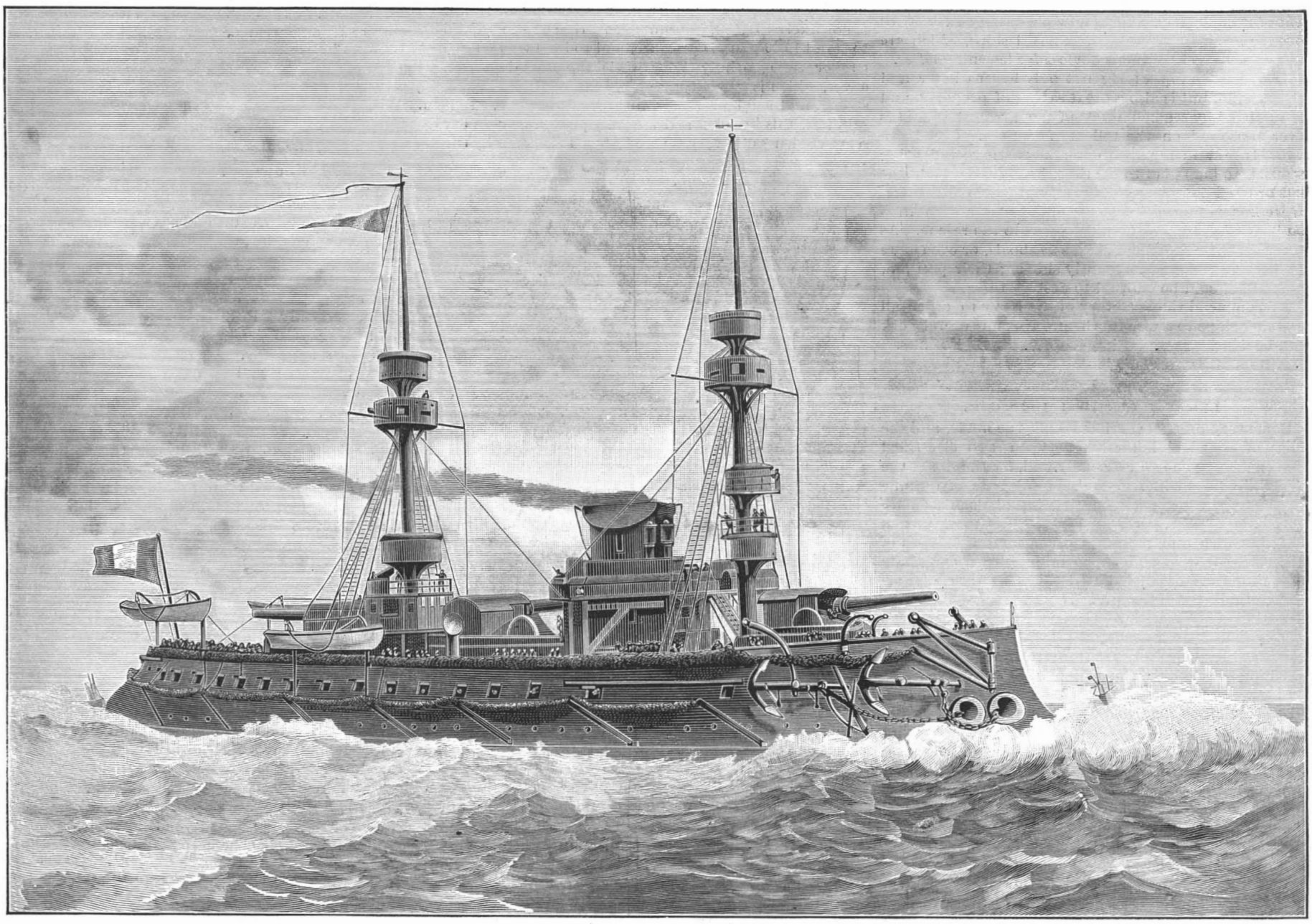
The steel hull is partially armor-plated, the armor covering a region which extends over the float water line from stem to stern. A cuirass protects three turrets, in which are placed the large pieces of artillery, and covers, up to the ironclad deck, the passageway for the projectiles designed for these guns. Finally, for the commander, there is an ironclad place of shelter, proof against the fire of musketry and light guns.

Scientific Uses of the Eiffel Tower.

M. Janssen, of the Institut France, is of opinion that the Eiffel tower will have many scientific uses. One of the greatest difficulties of meteorological observations is the disturbing influences of the station of observation itself. How, for example, can a true deviation of the wind be observed if a purely local obstacle causes it to deviate? And how can a true temperature of the air be determined by a thermometer influenced by radiation from surrounding objects? Thus the meteorological elements of great centers of habitation have to be taken outside those centers, and at a certain height above the soil. The tower, since it rises to a great height, and, from the nature of its construction, does not modify in any way the meteorological elements to be observed, will get over this difficulty. A height of 300 yards is in itself not a negligible quantity from the point of view of rainfall, temperature, and pressure, but these circumstances give all the more interest to the institution of comparative experiments on variations due to altitude. The electrical interchanges between the soil and the atmosphere can also be studied to advantage. Special arrangements can be made for round the tower at this elevation is free from all influence of the soil, as would be the case at the top of a mountain, and the air is in an extraordinary active state of electricity. The tower will, it is said, be the most perfect conductor of electricity during a storm, and all within it will be in a state of entire immunity against all danger from lightning.

A New Channel Steamer.

The new Calais mail steamer which has been built for the London, Chatham, and Dover company, has been named the Calais-Douvres, the name having been taken after the popular twin ship, which is now to be finally withdrawn from the service. The new vessel is built entirely of steel, and to insure additional safety in case of collision has been divided into nine different watertight compartments. The dimensions of the vessel are as follows: Length between perpendiculars, 325 feet; breadth, 36 feet; depth, 21 feet 6 inches. It is calculated that she will be the fastest cross Channel steamer afloat, and will make the passage between the English and French coasts easily in an hour. The vessel is being luxuriously fitted throughout, and, in addition to a fine deckhouse and state saloon, has a large number of private cabins. The steamer has been constructed with a view to combine steadiness with speed, and has all the latest improvements in machinery and fittings. She will be lighted by incandescent electric lamps, and has been provided with embarkation arc lights.



THE FRENCH WAR SHIP AMIRAL BAUDIN.

The motive apparatus consists of two distinct engines, separated by a tight median bulkhead, and each actuating a screw, so that, in case of accident to one of them, the ship may not be brought to a standstill.

The artillery comprises three 14½ inch guns in the turrets, twelve 5½ inch guns in the battery, and a multitude of revolving and rapid-fire guns distributed over the quarter deck and among the tops.

Neither of the vessels has any canvas. The masts shown in the engraving are such as are called "military" ones, that is to say, they are designed exclusively for carrying revolving guns that permit of directing a plunging fire against torpedo boats.

Since the putting of these new vessels in service has led us to speak of our armorclads, we ought to add that our engineers were better inspired than the English engineers when they conceived the plans of them. The report just published by the English Admiralty upon the maneuvers of 1886 points out, in fact, that the English armorclads, not high enough above water in front, are in a condition of sensible inferiority as regard sailing qualities. Thus, for example, the Trafalgar stands but eleven feet out of water, while, with a nearly similar draught, the height of the Amiral Baudin above water is nineteen feet. The result is that, with equal power, and provided the sea was rough, the French armorclads would have the advantage.—*L'Illustration.*

avoiding accidents, and results of great interest should be obtained.

He recommends also the institution of a service of meteorological photography. A good series of photographs would give forms, movements, modifications, which the clouds and atmospheric conditions undergo from sunrise to sunset. Thus a history of the skies would be written on a radius not hitherto dealt with. In physical astronomy various other observations might be taken, especially in relation to the study of telluric spectrum. M. Eiffel announces that three laboratories have already been arranged on the tower. One will be devoted to astronomy, and the second will contain registering apparatus from the central bureau of meteorology, and will be devoted to physics and meteorology. MM. Mascart and Cornu expect to draw great advantages from its use in the study of the atmosphere. The second is reserved for biology and micrographic study of the air, to be organized by M. Henocque. M. Cailletet is arranging a great mercurial manometer, with which he expects to obtain pressures as high as 400 atmospheres

M. De Fonvielle has made very curious electrical experiments at the summit of the Eiffel tower. Some, it is considered, will lead to important considerations of a scientific character, which will be continued; others are of a more practical character. The atmosphere

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WHEN a man presents himself to the United States inspectors as an applicant for marine engineer's license, he must have his application signed by two or three persons who can speak knowingly of his character and capabilities; and it is reasonable to think that no one can judge of his ability as well as the engineer with whom he has been employed—for every applicant for engineer's license must have had at least one year's experience aboard a vessel—although in strict adherence to the law, it is not necessary to have an engineer's name signed to an application. While the inspector can test his qualifications as an engineer by examination, he cannot judge of his character as to sobriety and integrity by the same process. Hence any man who signs a man's application for license has a certain responsibility resting upon him, for no man should be licensed as a steamboat officer of any grade who does not stand fairly before the world.—*The Am. Engineer.*

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FREDERICK A. P. BARNARD.

An able critic has said of him: "Among the promoters of science and liberal culture in our time, few men have labored more efficiently and successfully than the present versatile and accomplished president of Columbia College."

Frederick Augustus Porter Barnard was born in Sheffield, Mass., on May 5, 1809. His father, Robert Foster Barnard, was a lawyer of eminence, and served in the Massachusetts Senate, and his mother was the daughter of Dr. John Porter, of Salisbury, Conn. His ancestry on both sides was of English origin, and could be traced back to William the Conqueror.

His early education was begun in Sheffield, under the tuition of Dr. Orvill Dewey, and continued at Saratoga Springs, where he was sent at the age of nine, and there entered the academy. Incidentally his attention was directed to the printing office in that town, and he learned to set type. He was prepared for college at Stockbridge, Mass., by Jared Curtis, and then entered Yale. In 1828 he was graduated there, standing second in his class, but leading in pure mathematics and the exact sciences.

At once he began to teach at the Hartford Grammar School, and also contributed to the Hartford *Review*, then edited by the Quaker poet John G. Whittier, whose intimate friend he became. In 1830 he returned to Yale as a tutor, but after a year he accepted an appointment at the American Asylum for the Deaf and Dumb, at Hartford. This place he sought, owing to his loss of hearing, resulting from an illness, and also as the difficulty was hereditary in his family. He was called, in 1832, to the Deaf and Dumb Institution in New York City, and continued there for five years. The buildings were the same as those now occupied by Columbia College, to which institution he returned in after years.

In 1837 he was chosen to the chair of mathematics and natural philosophy at the University of Alabama, where he remained until 1848, when he was transferred to the charge of chemistry and natural history, which he held until 1854. Meanwhile he studied theology, and was admitted to holy orders in the Protestant Episcopal Church in the latter year. He was then called to the chair of mathematics and astronomy at the University of Mississippi, of which institution he was chosen president in 1856 and chancellor in 1858. While so connected, Jefferson Davis, afterward president of the Confederate States, was one of his colleagues. At the beginning of the civil war he severed his relations with the university and endeavored to come North. Efforts were made to induce him to join the Confederate government, but he refused all offers of appointments. He was denied a pass through the lines and compelled to remain in Norfolk, Va., until the place was captured, in 1862, by the United States troops.

He then went to Washington and was made director of the map and chart department of the United States Coast Survey, and by reason of his long residence in the South proved of great service in the preparation of maps used by the national armies. The chair of physics in Columbia College having become vacant in consequence of the expulsion of Richard S. McCulloh, who had joined the Confederate States, President Barnard sought that appointment, but the resignation of Charles King from the presidency of Columbia led its trustees, in May, 1864, to call President Barnard to that place. This office he filled until the close of the last collegiate year, when failing health compelled him to offer his resignation. Although unable to actively take part in the duties of the office, he continued nominally the president of Columbia College until his death. His clear judgment, remarkable executive ability, and fondness for work resulted in the remarkable development that has occurred in that institution since his connection with it. The School of Mines, perhaps the foremost scientific school in this country, was the first of the innovations to which he gave his earnest attention. The School of Political Science, the School of Library Economy, the department of women, known as the Barnard College, the gathering of the many departments into the magnificent buildings that now constitute almost a university at 49th Street and Madison Avenue, are largely due to him.

In other ways President Barnard likewise distinguished himself. In 1846 he was appointed by the Governor of Alabama as astronomer on the part of that State to assist in determining the boundary line between Alabama and Florida, and as the representative from the latter State did not qualify, President Barnard was employed by both States. His report, submitted to the legislatures of the two States, was accepted as conclusive. He served, in 1860, on the astronomical expedition sent to Labrador by the United States Coast Survey to witness the total eclipse of the sun.

While in Washington he was engaged in continuing the reductions of Lieutenant James M. Gilliss' observations of the stars of the southern hemisphere, and in 1863 had charge of their publication. In December, 1866, he was appointed by Congress to be one of the commissioners to the World's Fair held in Paris in 1867, and on his return made an elaborate report on "Machinery, Processes, and Products of the Industrial Arts and Apparatus of the Exact Sciences," which was published in the government reports. At the Centennial Fair, held in Philadelphia in 1876, he was one of the judges on instruments of precision, and in 1878 was Assistant Commissioner-General at the World's Fair held in Paris during that year, when the French Ministry conferred on him the decoration of the Legion of Honor.

The degree of LL.D. was given him by Jefferson College, Miss., in 1855, and by Yale in 1859; the University of Mississippi, in 1861, conferred on him the degree of S.T.D.; in 1872 that of L.H.D. was given him by the regents of the University of the State of New York; and in 1878 King's College, Canada, made him a D.C.L.

His name was on the rolls of numerous scientific associations, both in this country and abroad, including the American Philosophical Society and the American Academy of Arts and Sciences. He was chosen president of the American Association for the Advancement of Science in 1860, was one of the original members named by act of Congress, in 1863, as forming the National Academy of Sciences, was the chairman of its physical section in 1872, and foreign secretary in 1874–80. He was president of the Board of Experts of the American Bureau of Mines in 1865, and was president of the American Institute in 1872, also in 1873 of the American Meteorological Society. He served with Prof. Arnold Guyot as editor-in-chief of "Johnson's New Universal Encyclopedia," to which great work he contributed a large number of scientific articles, in addition to his editorial labors.

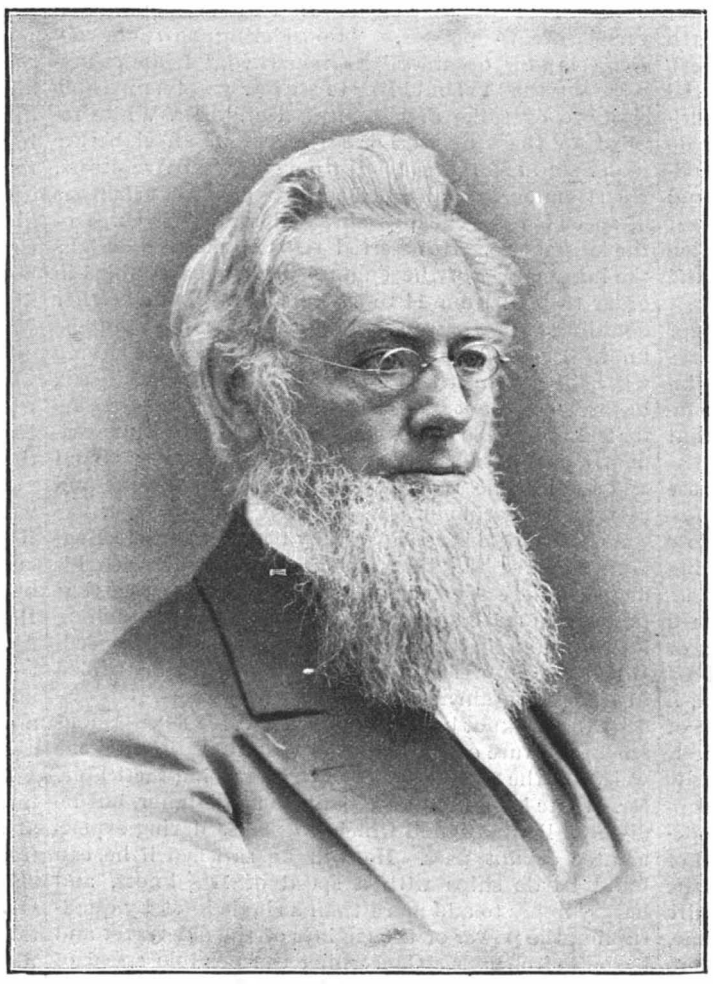
His contributions to scientific literature were many. He wrote for the *American Journal of Education* from its beginning, and his first paper in the *American Journal of Science* appeared in 1838. His works in book form include: "The School Arithmetic" (1829), "A Treatise on Arithmetic" (1830), "Analytic Grammar, with Symbolic Illustrations" (1836), "Letters on College Government" (1854), "Report on Collegiate Education" (1854), "Art Culture" (1854), "History of the American Coast Survey" (1857), "University Education" (1858), "Undulatory Theory of Light" (1862), "Metric System of Weights and Measures" (1871), and numerous reports on educational matters presented to the trustees of Columbia College.

His death came on the afternoon of April 27, while resting quietly in his chair at his home, adjoining the college. The funeral services were held in St. Thomas' Church on the 2d instant, after which his remains were taken to Sheffield for interment.

His life-long friend, the poet Whittier, in 1870 wrote the following lines on him:

"Rich, from life-long search
Of truth, within thy academic porch
Thou sittest now, lord of a realm of fact,
Thy servitors the sciences exact;
Still listening with thy hand on Nature's keys,
To hear the Samian's spheral harmonies
And rhythm of law."

M. B.



Frederick A. P. Barnard, Columbia College.

THE LATE PRESIDENT BARNARD OF COLUMBIA COLLEGE.

Leather Tanning by Electricity.

A French firm (MM. Worms & Bale) have succeeded, after long endeavors, in applying electricity to the art of tanning in such a way as is claimed to accelerate the process. We are now able, says the *Electrician*, to give some further information as to the method adopted, and although our knowledge of the art does not enable us to offer any opinion as to the precise value of the invention, yet we are very hopeful that it will ultimately afford an important outlet for electrical apparatus. What is actually done is very simple. The rawhides are placed in large cylinders which revolve upon horizontal axles. Provision is made for passing a current through the drum, the electrolyte being a decoction of tannin. (Further electrical details are at present wanting.) The drum is kept slowly revolving until the process is complete. The time required varies with the nature of the hide. Light calf skins, sheep and goat skins, which used to require from four to six months, are said to be completely tanned in twenty-four hours. Horse and ox hides require from seventy-two to ninety-six hours, while by the old-fashioned bark process they would have taken twelve months or even more. As to the quality of the leather, several French leather merchants have stated that it is above the average in strength, and has all the solidity and suppleness of the best samples. Specimens of harness, etc., made from this leather will be shown at the Paris exhibition. Furthermore, in addition to the economic value of the immense saving of time, it is stated that the working cost per pound of dry leather will be only 3½ to 4 cents, as against 7 to 8 cents per pound, which is the figure now reckoned by the Bermondsey tanners. The number of hands required is said to be only about one-fifth, and the capital expenditure is largely reduced. It is evident that if only half this be true, there is, to say the least, "something in it."

As to the scientific aspect of the question, the exact nature of the *role* played by the electric current is not at all clear. Prof. S. P. Thompson, who has examined the process, suggests that the effect may be in some way to open the pores of the hides and so permit a more rapid access of the tanning solution, and also that its chemical activity may be increased by the electrolytic action. Mr. A. Zwierzchowski thinks that the current renders the gelatine more soluble, so that it is able to combine more rapidly with the tannin.

M. E. Leonardi, in a recent number of the *Revue Internationale de l'Electricité*, mentions several schemes of this nature, all of them failures, the earlier ones necessarily so, from the lack of an economical means of producing current, while others suffered equally from a lack of electrical knowledge on the part of the "inventors."

Nine-inch Guns at Close Range.

The result of the recent Resistance experiments has been kept very close by the Admiralty and the naval authorities, but it has transpired that the result of shells filled with high explosives and fired from the 9·2-inch breech-loading gun was something terrible. The casemates were of two descriptions, some representing coal bunker protection and others the protection that is to be given to the batteries of 47-ton quick-firing guns in the ships Trafalgar and Nile. It was estimated that the casemates would give fair protection against the 6-inch breech-loaders and lighter guns, used at reasonable ranges, and as the 6-inch breech-loading gun will penetrate 9·8 inches of armor, with backing, at 560 yards, or 7·9 inches at 1,700 yards, this was surely all that could reasonably be expected. To fire at the Resistance with the 9·2-inch breech-loading gun at 100 yards range meant dire destruction, as this gun can pierce 19·6 inches of armor with backing at 160 yards, or 15 inches of armor with backing at 2,620 yards. Its results on the Resistance, therefore, at point blank range, with shells filled with high explosives, may be imagined.—*United Service Gazette.*

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Floriculture.*

The cultivation of flowers is an occupation that improves alike the body, mind and heart. It is an almost certain indication of purity and refinement.

Floriculture, or the cultivation of flowers, is an art based upon the natural sciences—botany, chemistry, and entomology. Although a knowledge of these and kindred sciences will give much aid, it will not of itself make a good florist.

When a student has learned all that lectures and books can teach, he still needs observation, practice, and experience to make him master of floriculture. It is not a rude, simple matter, but requires and rewards the fullest command of science and the knowledge of nature's laws.

What is needed in the cultivation of flowers is more study, more thought, more enthusiasm, with less attachment to old ways, methods, and practices, which, if ever desirable or judicious, have long ceased to be so. If those who love flowers will intelligently resolve that their cultivation shall and must improve, it will not be long before we have an art worthy of our country and the age in which we live.

We can afford to cultivate and study flowers if for no other reason than their cheerful surrounding. Many do without flowers because they think that they cost too much time and trouble, but one does not have to think long to be convinced that all things worth having cost considerable and that anything worth having is worth working for. Oftentimes the partial success or in many instances total failure in the cultivation of flowers is due to the fact that we try to do too much, that our gardens are too large and not sufficiently cared for. No one should have more ground devoted to a garden that can be kept in the highest state of cultivation. Excellence affords satisfaction and pleasure, while failure brings mortification and pain.

The same may be said of house plants or plants kept within doors during the winter. Too often do we see many plants crowded together in a poorly lighted window, compelling each plant to take on a form never intended by nature and foliage quite different from that desired by the owner.

One of the chief requisites in management of house plants is plenty of sunshine.

Next is an atmosphere neither too dry nor too close and a uniform temperature (lower at night than during day).

Some practical hints as to watering may be summed up as follows: Rain water is better than spring or well water. Hard water may be greatly improved by adding a drop or two of ammonia or a little soda, a small nugget about the size of a pea to every gallon of water used. As to time of day, morning is the best, and next is the evening. Never water house plants when the sun is shining brightly upon them; the supply of water must be regulated according to the demands of the plant; the condition of the plant and of the soil is the best guide. Never give water when the soil is moist to the touch. Nearly all plants require more water when in bloom than at any other time, more in a warm temperature than in a cold, and more when in a state of active growth than when at rest. Plants in open rooms usually require water once a day and some demand it twice, at any rate all should be examined with interest to water at least every day.

Cleanliness is essential. The leaves of plants should be kept free from dust, hence frequent washings are absolutely essential, although when watering never wet the flowers of a plant nor allow drops of water to stand on the leaves in the sunshine. Never allow water to stand in the saucers of the pots unless the plants are semi-aquatic. Watering is at least two fold. It supplies plants food or elements of fertility contained in itself and converts the plant food or nourishment of the soil into a liquid form, so that it may be absorbed by the roots. The roots of a plant must be kept moist, not wet.

When the drainage is the most perfect, plants will generally be the healthiest and will need watering the oftenest.

Give house plants as much light as possible during the day, and darkness with a lower temperature at night.

Plants require rest; a uniform temperature of 60 or 70 degrees in the daytime and 40 to 45 degrees at night will give the best results.

Turning the plants toward the light should not be done, unless done regularly. Besides light, house plants require a good supply of fresh air. Ventilation is absolutely necessary.

A word as to the restoration of cut flowers that have become wilted; the question is often asked, "How can I restore or refresh this flower?" It may be a rare flower, or one that is prized highly as the gift of a friend—in either case joy will follow its restoration. Cut flowers have frequently been restored to freshness, even when every petal is drooping, by placing the stems in a cup of boiling hot water and leave them until the petals have become quite smooth, then cut off the cooked ends and place in lukewarm water, and for this purpose pure rainwater is thought to be preferable. The freshness of cut flowers is due wholly to two conditions, either evaporation from the flowers must be prevented by inclosing in a case containing a saturated atmosphere or the evaporation must be supplied by moisture at the cut end or stem. This stem is composed mostly of woody fiber or cellulose, whose power to absorb water soon diminishes, hence to enable the stem to absorb the most water, the end must be frequently cut off.

* A paper read by George C. Watson before the Clyde Grange Natural History Society.

The Limit in Naval Speed.

An important controversy has arisen in England between two eminent naval experts respecting the speed of modern war ships recently designed. The battle ships which the Admiralty is now constructing were originally credited with a speed of 16½ knots, forced draught; but in working out the designs, Mr. White, director of naval construction, found it practicable to increase the speed to 17½ knots. Sir Edward Reed complained that the increase in speed was too slight in the new designs to be seriously considered, and contended that 20-knot battle ships could be built with a coal supply far beyond that which the proposed vessels are to possess. "Considering how cheaply speed is now obtained," he remarked, "I cannot myself deny that I should like to see our great ships able easily to overtake any enemy's fleet." Mr. White replied to these and other strictures in an elaborate paper read before the Institution of Naval Architects. He strenuously challenged the statement that increase of speed is to be cheaply obtained for battle ships of the largest size. He asserted that in the new designs the horse power of the engines had to be doubled in order to pass from 14 to 17 knots, and that a further doubling of power would not add much more than one knot. By quadrupling the power, battle ships having a speed between 18 and 19 knots might be produced; but this could not be considered a cheap increase. As for 20-knot battle ships, the great English designer evidently prefers to have some other expert try his hand and assume the responsibility for so hazardous and costly an experiment.

As Mr. White is considered by naval experts in England to have the best of this controversy with his disputatious critic, it may be reasonable to assume that progress in marine engineering is rapidly approaching its maximum limit in producing vessels of high speed. If the horse power of the engines has to be quadrupled in order to obtain a battle ship of 18½ knots, it is evident that 20-knot battle ships will involve so enormous an expenditure of power and so vast an addition to the weight of the machinery as to be utterly impracticable. Mr. White has been a most ambitious designer, but he discerns limits beyond which the most daring experimenter cannot pass. He will be satisfied if he can build battle ships with a speed of 17½ knots, and hardly hopes to add more than a single knot by quadrupling the power of the engines of the old turret and barbette ironclads. Concerning the possible speed of fast cruisers he has nothing to say, but his argument points unerringly to a limit beyond which experimenting is unscientific and foolhardy. The American cruisers, which are expected to make 19 or 20 knots, were practically designed by him when he was in the employ of the Armstrongs. Whether they will succeed in accomplishing that result is a question on which expert testimony is divided. But even if the Charleston and Baltimore are as fast as the designers anticipated they would be, it is hardly reasonable to expect any great advance in speed above 20 knots for war vessels.—*N. Y. Tribune.*

Warren de la Rue, D.C.L., F.R.S.

The death is announced of Mr. Warren de la Rue, at the age of seventy-four. A native of Guernsey, he was educated in Paris, and succeeded his father as head of the firm of Thomas de la Rue & Co., from which he retired in 1880. His earlier contributions to science were chiefly papers on voltaic electricity and the deposition of metals. Subsequently he published a memoir on cochineal, and, in conjunction with his friend, Dr. Hugo Muller, another on the constituents of rhubarb, among which they were the first to observe chrysophanic acid. But his name is most associated with the application of photography to the recording of celestial phenomena, on which subject he produced a large number of papers. In connection with Dr. Muller also he carried on a series of investigations upon the electrical discharge, using a battery of 15,000 chloride of silver cells, the results of which were given in a collected form in a lecture at the Royal Institution in 1881. Among the many honorary posts filled by Mr. De la Rue may be mentioned those as honorary secretary and afterward president of the Astronomical Society, president of the Chemical Society for two separate periods, president of the London Institution, and secretary of the Royal Institution. In addition, he was a member of numerous foreign learned societies.

Thomas Summers.

There has recently passed away a man, some record of whose life and works it is a duty to prepare. To make such a record adequate is difficult, if not impossible, because the man's modesty and reticence drew on him little attention. He slipped quietly through life doing a good work without boasting; how important that work was, few engineers perhaps realize outside of a limited circle.

Says *The Engineer:* Thomas Summers was born in London in 1825. He was educated as a boy at a Quakers' school, and subsequently he studied in the evenings at schools connected with the University of London; about this period he was articled to Mr. Haigh, who failed, and Mr. Summers finished his apprenticeship in the marine engineering works at Southampton of W. Altoft Summers. That gentleman retired from business about the year 1858, and died a few years ago. Mr. Altoft Summers had at different times three partners, namely, Mr. Groves, Mr. Baldock, and Mr. C. A. Day; the two former retired, and left the firm Summers & Day, under which title it was long known, and enjoyed a high reputation. Thomas Summers seems to have taken a leading place in the drawing office soon after his apprenticeship was completed, and he ultimately left the drawing office to become manager; under his hands the works developed rapidly, at one time employing over 2,000 hands.

Mr. Summers' strong point was marine engineering, and on it he has left his mark. During his career as a draughtsman he wrote a good deal for the few engineering journals which then existed, and his reputation extended rapidly. At last he was invited by the Turkish government to take private pupils to learn marine engineering, and to a limited extent he did this. He constructed the machinery for several Turkish gunboats, and also for certain Egyptian steamers. He fitted H. M. S. Pandora with her machinery. This vessel was subsequently bought by Mr.—now Sir Allen—Young for his Arctic explorations, and the Pandora was handed over to Mr. Summers for a thorough refit when she was being prepared for her Arctic voyage. In process of time Mr. Summers became a partner, and the firm took the title of Day, Summers & Co.

A large part of his work was done in connection with the Peninsular & Oriental Company and the Royal Mail Company, whose headquarters were to a large extent at Southampton. He was also employed by the West India Company, the Union Company, the Hamburg Companies, and the North German Lloyd's. A short time after the Great Eastern made her first trip she was put into the hands of the firm to make good many things in which she was defective and deficient, and she lay in Southampton water for this purpose for about six months.

Mr. Summers in an indirect way did a great deal to introduce the surface condenser. That was first used at sea by Hall many years before. It was taken up freely, if experimentally, long subsequently by various shipping companies, most eagerly by the Peninsular & Oriental Company. The experiment was a disastrous failure. The brass tubes in the condenser were literally eaten up by the soft water charged with fatty acids from the engines. The boilers also suffered severely. Mr. Summers solved the difficulty at a stroke by tinning the tubes, and ever since only tinned tubes have been used. We are not prepared to say that Mr. Summers was the actual inventor of tinning, but he, at all events, recognized the value of the system, and employed all his energies to get it tried on an adequate scale. The result is too well known to render it needful that we should dwell on it here. With the success of the surface condenser the road to compounding lay open. Mr. Summers traversed that road with his whole heart in his work, and his firm constructed hundreds of compound engines which took the place of the old type of machinery.

Mr. Summers was a great believer in giving accuracy of form and fine surface to propeller blades. Instead of being rough castings, he fitted ships with propellers chipped and filed and finished with great accuracy. The results were eminently satisfactory.

An interesting piece of work which he did was the construction of the engines of the Winans cigar ships, still lying in Southampton water. These engines were described in our pages many years ago; they were of the kind, perhaps, never exceeded for perfection of workmanship and design.

Mr. Summers, if not a prolific inventor, at all events produced several things which will live. Among these we mention the shear legs which have been fitted up for every civilized government in the world possessing war ships. These shear legs will lift a turret clear out of a ship, and replace it with another complete.

Mr. Summers enjoyed an unrivaled reputation for probity and straightforward dealing.

THE "regal red poppy" has recently been found to have the valuable power of binding with its roots the soil in which it grows in such a manner that it will prove most valuable in supporting embankments. Already several French engineers have undertaken the sowing of railway embankments with poppies.

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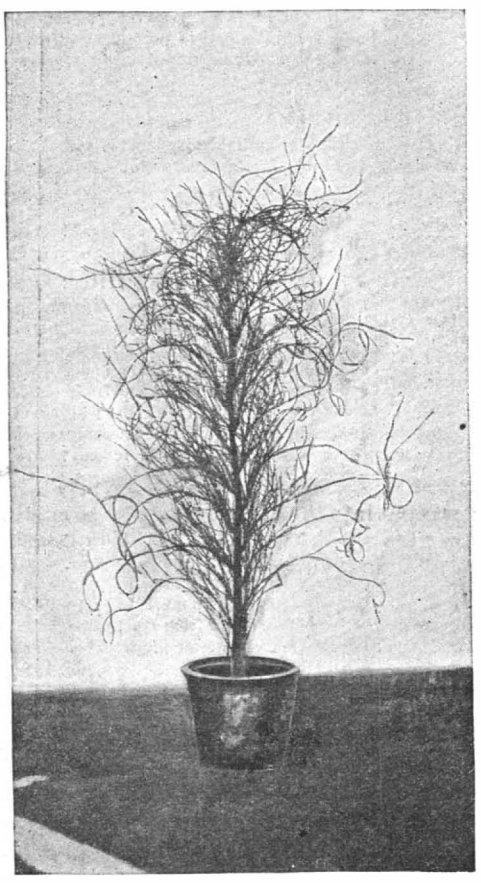
A CURIOSITY IN PLANT LIFE.

BY N. W. HALCOMB, OF JAPAN.

In the autumn of 1888, while I was residing at Fukui, in Japan, there came under my observation one of those anomalous freaks of nature which are of such frequent occurrence, and it was of such a striking character that I deem it worthy of special notice. For several days I had heard my Japanese friends speak of a wonderful bamboo which was on exhibition at a certain gentleman's house, and which was attracting many visitors. My curiosity being awakened, I called with a friend at the house of the owner of the strange plant, and when I saw it, did not wonder at the attention it had attracted. It had grown that season in the bamboo grove of Mr. Suzuki, the gentleman who exhibited it.

The accompanying sketch was made from a photograph taken soon after the plant was transferred from the grove to a flower pot, which event took place on the 22d of September. The plant had first been observed in the latter part of May, and though somewhat peculiar in appearance, did not attract especial attention. It was not noticed again until the autumn, when it appeared as in the engraving. It is of a species of bamboo called in Japanese *madake*, the next to the largest of the ten or twelve species that grow in that part of Japan. This species grows from twenty to forty feet high and often attains a circumference of fifteen inches or more. The circumference often does not exceed six or eight inches. As is well known, the bamboo attains its entire growth the first year, and the appearance of



A CURIOSITY IN PLANT LIFE.

the plant in the engraving, being essentially the same as when I saw it on October 29, may be taken as its matured and final form. Among its abnormal features may be noticed its small height, 5 feet; its small circumference, 4·56 inches; the large number and shortness of the joints, the whole number from base to tip of the longest limb being 107, or fully twice the usual number; the large number, length, and peculiar curling shape of the limbs, one measuring 3 feet 10 inches in length, or nearly four-fifths of the height of the plant, while many smaller limbs—ten or twelve—grow from the larger ones, two or three of these latter springing from each joint of the main stem; and the nearly total lack of leaves, only fifteen of the limbs having leaves, and they having very few. It is also worthy of remark that at each joint of the limbs is a bud, and near the ends of many limbs are several larger developments like miniature reproductions of the huge sheath that incases the young bamboo shoot when it just emerges from the ground.

One other plant of the same general character was found at Fukui the same season, but the peculiar features were much less strongly marked than in this one. The Japanese told me that these two were the only ones of the kind that had ever been seen, so far as they knew. In old groves of that particular species of bamboo, a bunch of abnormally developed limbs, slightly similar to those of the plant described, will not unfrequently grow from one or more joints of an otherwise healthy-looking plant. It is supposed to indicate a diseased condition of the plant on which it grows, and the plant above described may be an unusual instance of such abnormal development. The grove in which it grew was very old, and I saw quite a number of the peculiar bunches of limbs growing from healthy-looking plants. Another bamboo which grew from the same root as the one described exhibited no peculiar features, except that it was rather small.

Heat and Light.

At a recent meeting of the Physical Society, London, Mr. Shelford Bidwell, F.R.S., showed "A Lecture Experiment Illustrating the Effect of Heat on the Magnetic Susceptibility of Nickel," and "An Experiment Showing an Effect of Light on Magnetism." In the first experiment a piece of nickel was attached to one side of a copper pendulum bob, which was held out of the vertical by bringing the nickel in contact with a fixed magnet. On placing a spirit lamp flame below the nickel, the bob was (after a short time) released, and oscillated until the nickel had cooled, when it was again attracted, and the operation repeated itself. The second experiment had been recently shown before the Royal Society. One end of an iron bar which had been magnetized and then demagnetized was placed near a magnetometer needle. On directing a beam of light on the bar an immediate deflection of the needle resulted, and on cutting off the light the needle promptly returned to near its initial position. The direction of magnetization induced by the light is the same as the previous magnetization, and the bar seems to be in an unstable magnetic state. That the effect is due to light and not heat the author thinks is rendered probable by the suddenness of the action.

The President, Prof. Reinold, said he had tried the experiment himself and failed to get any effect, but after seeing the arrangement of apparatus used, he believed his non-success due to the comparatively great distance between his bar and needle. A member asked if the results were different for different colored rays, and Professor S. P. Thompson inquired whether the magnitude of the effect varied with the intensity of illumination, as in selenium, and also if any change was produced by altering the direction of vibration of the incident light. Mr. G. M. Whipple wished to know whether any difference was produced by blackening the bars, and as bearing somewhat on the same subject mentioned an induction magnetometer in which an iron bar used was demagnetized by plunging in hot water. The results obtained were very irregular after the first magnetization, and this may have been due to the instability shown to exist by Mr. Bidwell's experiment.

In reply, Mr. Bidwell said red light produces most effect, and blackening the bar makes the action much slower. As regards selenium, the character of the effect is similar, but he believes the causes to be different. Polarized light produces no change. In answer to Professor Herschel, he said that any part of the bar is sensitive to light, and showed that illuminating both sides of the bar increased the effect.

Profitable Watch Manufacturing.

At the annual meeting of the Waltham Watch Company, in Boston, recently, it was voted to increase the capital stock of the company by $1,000,000, making the total capital $3,000,000. A cash dividend of 50 per cent was also declared. The treasurer of the company, in explaining the matter, said that the company had a surplus of $2,000,000 above its capital. The capital stock had been increased to the extent of the cash dividend, and those of the stockholders who wished could take the cash they received in dividends and purchase new stock at par in pro rata proportion to what they already held. It was not a stock dividend. The other $1,000,000 surplus would be used in carrying on the business of the company. There would be no additions to the works on the head of the increase in stock. In 1865, when the capital stock was $300,000, a dividend of 150 per cent was made and the stock increased to $750,000. In 1880 a dividend of 100 per cent was made and the capital increased to $1,600,000; and in 1885 the stock was increased $500,000, for which the stockholders paid.—*Bradstreet's.*

Good Advice to Engineers.

It cannot be too carefully borne in mind that condensing engines must be absolutely tight as to their valves and pistons in order to secure economy. Many condensing engines are actually using more steam per horse power than they would if run high pressure. Steam leaks into a vacuum much faster than it does into the atmosphere or through the valves and pistons of high pressure engines. There should be at least 26 inches (not pounds) of vacuum in every condenser, and unless there is, there is a defect somewhere in the design, or leaks in the apparatus, either steam or air, and perhaps both. Air leaks are easily found with a lamp. Any suspected spot can be readily tested with a lighted jacket lamp. Apply the flame to the place, and if there is any leak the flame will be drawn in. Chaplets used for holding up the cores of large exhaust pipes, when cast, are often a source of leakage, for, as part of the rod remains in the casting, it cannot be always told whether the union is absolutely airtight. Such spots should be well puttied over with thick red lead putty. Leakage often occurs through faults in the foot valves. Since the air pump is open to the atmosphere unless the foot valves are absolutely airtight, under all circumstances, the vacuum will be injured very much. Air leaks, however, have to do only indirectly with the economy of a plant. The steam leaks are the worst sources of loss, and against these all engineers know so well how to provide that we need not offer suggestions.—*The Engineer.*

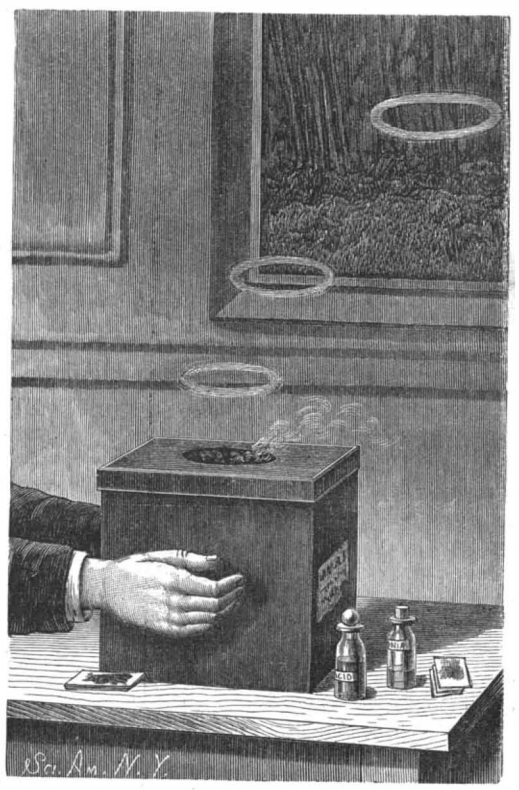
VORTEX MOTION.

BY GEO. M. HOPKINS.

Every one has noticed the symmetrical wreaths of smoke and steam occasionally projected high into the air on a still day by a locomotive; similar rings may often be noticed after the firing of a gun. It is not uncommon to see a smoker forming such wreaths with his mouth. These rings are simply whirling masses of air revolving upon axes curved in annular form, the smoke serving to mark the projected and whirling body of air, thus distinguishing it from the surrounding atmosphere. The whorls would exist without the smoke, but they would, of course, be invisible.

All the apparatus needed for producing vortex rings at will is an ordinary pasteboard hat box, having a circular hole of 4 or 5 inches diameter in the cover. Two pads of blotting paper are prepared, each consisting of six or eight pieces. Upon one pad is poured a small quantity of muriatic acid and upon the other a similar quantity of strong aqua ammonia. These pads are placed in the box and immediately a white cloud is formed, which consists of particles of chloride of ammonium so minute as to float in the air.

By smartly tapping opposite sides of the box, a puff of air is sent through the circular opening of the cover carrying with it some of the chloride of ammonium.



VORTEX RINGS.

The friction of the air against the edges of the cover retards the outer portion of the projected air column, while the inner portion passes freely through, thus imparting a rotary motion to the body of air adjoining the edge of the cover, the axis of revolution being annular. After the ring is detached the central portion of the air column continues to pass through it, thus maintaining the rotary motion.

When two rings are projected in succession in such a manner as to cause one to collide with the other, they behave much like elastic solid bodies. By making the aperture in the box cover elliptical, the rings will acquire a vibratory motion.

By fastening the box cover loosely at the corners, the box may be turned upon its side and rings may be projected horizontally.

It is obvious that smoke may be used in this experiment in lieu of the chloride of ammonium.

Phthisis from House Sweepings.

The *Munchener Medicinsche Wochenschrift*, No. 308, reports that Carnet has experimented with the dust obtained from the walls and floors of various dwellings in which tuberculous patients have been, inoculating guinea pigs with it, and carefully excluding all possibility of infection from outside sources. In this way, twenty-one rooms of seven Berlin hospitals were examined, and bacilli found to have been present in the dust from most of them. Positive results were also obtained with the dust from insane asylums and penitentiaries.

The dwellings of fifty-three tubercular patients were investigated in the same way, and the dust in the neighborhood of twenty patients found to be virulent. It was the case, with absolute regularity, that the dust was always virulent when the patient had been in the habit of spitting on the floor, or in a handkerchief, while it was never so when a spit cup had been employed.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

FISH PLATE.—Thomas A. Davies, New York City. The object of this invention is to provide a frictionless and rigidly attached plate, in which all the wear will be sustained by keys interposing the plate and flange of the rail, which keys may be readily detached and replaced, the plate being capable of expeditious and convenient attachment to or detachment from a rail. The same inventor has likewise obtained another patent on fish plates, in which the construction is simple and economical, the plates being combined with an inserted table and wedge, whereby they will be effectually held in essentially rigid contact with the rail, both laterally and vertically.

SECURING RAILS TO SLEEPERS.—Karl Louis Gocht, Chemnitz, Saxony, Germany. Combined with a rail and an inverted U-shaped sleeper, having an opening in its top, is a chair projecting through the opening from beneath, together with a frame beneath the rail, and means for locking the frame to the chair, the device dispensing with the use of bolts, spikes, and wedges, as with ordinary wooden sleepers.

NUT LOCK FOR RAIL JOINTS.—George C. Illingworth, Raritan, N. J. This is a device especially adapted for use with railroad rails, and which, when applied to the joints, will not be loosened by the vibration of the rail, and will also provide against the spreading of the rails, while obviating the necessity of tightening the lock nuts daily.

CAR COUPLING. — James A. Morse, Fort Bowie, Arizona Ter. In this coupling a standard is attached to the drawhead provided with a friction roller engaging with the pin, while a lever arm is pivoted at one end in the upper front surface of the drawhead, and there is a link connection between the upper end of the pin and the lower extremity of the arm, the device being designed to work automatically.

Mechanical.

FEED WATER COCK.—Henry D. Medrick, Port Jervis, N. Y. This a cock specially adapted to receive water in its passage from the tank to the boiler, whereby the water will be effectively strained, and the sediment automatically washed out by the water supply.

MOTOR. — William R. Bell, New York City. A sleeve or shaft to be driven is formed with recesses in which are mounted pawls, rings with internal ratchets being arranged to be engaged by the pawls, while bands are connected to the rings and to a pawl, the object being to provide a simple motor for light running machines, such as sewing machines, etc.

ADJUSTMENT OF SHAFTS. — Benjamin A. Dobson, Bolton, Lancaster County, England. This invention is for enabling the accuracy of the adjustment and the concentricity of the main cylinder and its shaft in carding machines to be readily tested and determined, in compensating adjustments for wear.

Electrical.

ELECTRIC MOTOR. — Frederick Yeiser, Tampa, Fla. A shaft is journaled eccentrically in a series of coils, and a series of armatures arranged around a cylinder at equidistant points, a corresponding series of circuit-operating cams being carried by the shaft, while circuit making and breaking levers are adapted to be operated by the cams, the object being to construct a simple motor in which the power will be developed by the oblique approach of the armature to the center of the helix.

Miscellaneous.

COAL CONVEYER.—Gustavus L. Stuebner, Long Island City, N. Y. This invention relates to a conveyer for depositing coal in bins, so that wagons and carts may be loaded from a trap at the bottom of the bins, a series of buckets or receptacles being supported on a track and adapted to be moved beneath a hopper or spout and over the bins, automatically depositing their contents in the bins.

BURGLAR ALARM. — Neil McIntyre, Brooklyn, N. Y. This is a device to be screwed on the inner face of a door or window, and has a piston rod to be drawn out to a contact with the edge of the door, with an arm held between the door jamb and its contiguous edge, a cap being so placed that on the opening of the door or window a spring will be released to explode the cap.

LAST BLOCK FASTENER. — William Cook, New York City. Combined with a last body is a last block having a longitudinal slot and a countersink at the outer end of the slot, a flattened head being held to the last body by a fixed nail or screw, the head being adapted to be turned independently of the nail or screw to bring it wholly within the longitudial slot of the last block, or transversely thereto, the invention being an improvement on a former patented invention of the same inventor.

SHOE VARNISH BOTTLE. — John Hoerle, Brooklyn, N. Y. This botttle has a neck with lateral apertures to receive the ends of the thumb and forefinger, and a transversely compressible tube located in the neck, combined with a stopper having a wire to which is attached a sponge, whereby superabundance of the liquid may be squeezed out of the sponge as it is being withdrawn from the bottle.

SAFETY BURNER.—Joseph Mason, New York City. This device provides for the automatic shutting off of the supply should the gas go out or be blown out, and consists of an attachment having a gas passage in which there is a valve controlled by a spring and a diaphragm, the diaphragm forming one of the walls of an air chamber arranged in close proximity to the burner tip.

GAS GENERATOR.—Samuel McIlvaine, Oakwood, Ontario, Canada. This invention provides a retort having an open top and a central bottom elevation, a vertical cylinder being set on the retort and having a gas exit pipe, while a steam and oil pipe pass down through the cylinder and connect with a funnel which partly incloses the central bottom elevation, the apparatus being simple and adapted for household use.

ENGRAVING.—William S. Eaton, Sag Harbor, N. Y. This invention relates to machine engraving on metal, and consists in producing a series of engraved pattern plates, each having a fragment only of the design, but collectively forming the complete work, the plates being successively used in transferring the design to the article to be engraved.

CORSET BUSK.—Isaac Levy, Newport, R. I. This busk is formed of a number of wires connected together to constitute a light, stiff busk, which will be flexible laterally as well as longitudinally to adapt it to the movements of the body, and to take the place of other forms of busk in one piece, such as those made of flat strips of steel, whalebone, etc.

WALL PROTECTOR.—Roldin S. Robbins and Alphonzo H. Broad, Berkeley, Cal. This is a device adapted to be secured to the backs of chairs, sofas, and other pieces of furniture, and consists of a combined base plate and roller-supporting arms formed integral from a cast or stamped blank, the protector being adapted for use upon a vertical or inclined surface, in each case conforming to the line of the wall, from the globular shape of the roller.

GATE.—Cornelius C. Epp, Bradshaw, Neb. This is a gate particularly adapted for country roads, the gate swinging between from a hinge post and a latch post to a stop post, both the latter being provided with spring catches, and the gate being adapted to be operated by a rope or cord extending to some distance at the side of the road.

GRATING. — Donald McDonald, Louisville, Ky. This grating is composed of round bars of metal gained and intersecting each other, couplings covering the joint, and is especially adapted for the use of jails, in fences and other work.

BINDER.—Asa K. Owen, Lake Geneva, Wis. This is a temporary binder for holding bill and letter heads, in which the upper surface will be of the same level as the paper held by the binder, and in which the paper may be readily introduced in the binder and firmly held in the position of use.

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MAY NUMBER.—(No. 43.)

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6. A dwelling at Springfield, Mass. Plans and perspective elevation. Cost eight thousand five hundred dollars.
7. Engraving showing perspective elevation of a cottage erected at Roseville, N. J., at a cost of six thousand seven hundred and fifty dollars. Floor plans. F. W. Ward. architect, New York.
8. Illustration and floor plans of a combined school house and country cottage erected at St. Cloud, Orange, N. J. Arthur D. Pickering, New York, architect.
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10. A cottage built at Roseville, N. J., for six thousand seven hundred and fifty dollars. Elevation and floor plans.
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References to former articles or answers should give date of paper and page or number of question.

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Minerals sent for examination should be distinctly marked or labeled.

(832) W. F. B. writes: I have worried for some time over a musical paradox, and although my communication is somewhat lengthy, I hope you will kindly shed some light on my difficulty. The conditions I am to assume will no doubt seem ludicrous, but although not practical to demonstrate, I think they are theoretically possible. It is this: We will assume we have one thousand violoncellos, all of which are tuned with absolute precision, the string on any one of them corresponding exactly in pitch with the same string on any of the others. Now, according to the principle of sympathetic vibrations, if we vibrate the note "a" on one instrument, the other nine hundred and ninety-nine will respond loudly, and with increased loudness caused by the influence of so many instruments upon each other. If we now place upon the "belly" of one of them a one pound iron weight (the instrument being in a horizontal position), and vibrate with a bow a certain note, the belly will vibrate and the weight be agitated and moved. This we can readily demonstrate with a single instrument. Now, if we had placed a similar weight on each of the one thousand, would not all have been moved by their sympathetic vibrations? If so, we have moved one thousand pounds, which represents an expenditure of energy greater than was used to cause the vibration of the first instrument, and therefore a creation of energy. A. Each weight might be moved a very little, but the total work expended in moving them would not equal that expended in vibrating the original string. Again, it is an error to assume that the multitude of instruments will cause each individual one to vibrate more loudly than the first. The effect of so many is simply to absorb and reabsorb vibrations from the first, which else would have gone through space without being caught by sympathetically tuned strings.

(833) R. B. M. — Emulsions prepared with ammonia are very sensitive. See Abney's book on photography with emulsions. Gelatino-chloride paper is referred to. It may be printed out or developed. Chrome alum is introduced in the emulsion to make the film withstand heat. The following hydroxylamine developer is recommended:

No. 1.

Pyrogallol	437 grains.
Hydroxylamine chloride	60 "
Water	12 oz.

No. 2.

Sodium sulphite crystals	2 oz.
Sodium carbonate	4 oz.
Water	12 oz.

To develop, add one drachm of Nos. 1 and 2 to 2 oz. of water. We think the spots on the paper were due to acid silver bath.

(834) E. W. E. K. asks how the inner surface of a hollow glass sphere 12 to 18 inches diameter, such as are frequently met with in Europe, in parks and public places, used as reflecting mirrors for the surrounding objects and landscape, could be successfully covered by amalgam of tin, etc. (silvered). A. The following receipts are given for coating glass globes: *a.* Take 1/4 ounce of clean lead, and melt it with an equal weight of pure tin, then immediately add 1/8 ounce of bismuth, and carefully skim off the dross; remove the alloy from the fire, and before it grows cold add 5 ounces of mercury, and stir the whole well together, then put the fluid amalgam into a clean glass, and it is fit for use. When this amalgam is used for silvering, let it be first strained through a linen rag, then gently pour some ounces thereof into the globe intended to be silvered; the alloy should be poured into the globe by means of a paper or glass funnel reaching almost to the bottom of the globe, to prevent its splashing the sides; the globe should be turned every way very slowly, to fasten the silvering. *b.* Make an alloy of 3 ounces of lead, 2 ounces of tin, and 5 ounces of bismuth; put a portion of this alloy into the globe, and expose it to a gentle heat until the compound is melted; it melts at 197° Fah.; then by turning the globe slowly round an equal coating may be laid on, which, when cold, hardens and firmly adheres. This is one of the cheapest and most durable methods of silvering glass globes internally. For either process the globe must be very clean.

(835) Gillem, Barrie, writes: I am successful in lining underground cisterns for rain water against leakage by using Portland cement. I have tried the same plan in coating with Portland cement the walls and floors inside some cellars under dwelling houses, and cannot prevent a leakage from outside, although finished inside equal to a cistern lining. Can you or any reader of the SCIENTIFIC AMERICAN kindly explain the trouble and suggest a remedy? A. You cannot secure perfect tightness by cement alone. The floor must have a layer of asphalt or equivalent concrete either above or underneath the Portland cement concrete. If the latter is made thick enough, very little water will pass. As regards cisterns, if after they are perfectly dry you were to paint them with melted paraffin wax, it would do much to secure them, but if properly made and free from cracks, the leakage through Portland cement mortar properly backed should be imperceptible.

(836) H. P. S. asks (1) for the simplest way to obtain oxygen gas. A. Ignite in a retort a mixture of one-sixth part binoxide of manganese with three parts chlorate of potash. 2. How to keep it. A. Do not keep it, but make it on the same day it is to be used. You can collect it in India rubber bags or in a gas holder. 3. How to direct a stream of the gas through a spirit lamp on to a ball of quicklime. A. Expel it through a fine one-sixteenth inch nozzle from the bags or gas holder by placing weights thereon, and hold the nozzle just outside of the margin of the flame. It will act as a blowpipe. You can procure from the dealers apparatus for making the gas as you use it, and properly constructed alcohol burners, etc.

(837) "Mere Sham" asks (1) for a good method of coloring meerschaum pipes. A. Smoking tobacco in the pipe is the best method of coloring. They can be stained by wood-staining processes, but unsatisfactorily. 2. How to boil one. A. They are boiled by immersion in hot beeswax. It should be done by a qualified person.

(838) W. P. asks (1) how to soften paint brushes which have become hardened by paint drying on them. A. Soak in turpentine or benzine and renew the fluid occasionally. 2. How may they be kept soft when not using? A. Wash out thoroughly with turpentine or benzine after using, or if this is objectionable keep them in water. This will exclude oxygen or air, without which oil paint cannot dry.

(839) F. E. H. asks (1) for a receipt for making gunpowder. A. Pulverize separately nitrate of potash 75 parts, sulphur 10 parts, charcoal 15 parts, all by weight. Mix them with water and continue the pulverization for a long time, keeping it moist. Then roll out into thin cylinders and allow it to dry, when you may break it up into grains. 2. Also if saltpeter and niter are the same? A. Yes.

(840) N. M. asks if there is any case on record of spontaneous combustion under any circumstances in cotton waste or rags wet with kerosene oil. A. We know of no such case, and doubt its probability. Were such a case reported, we should suspect the presence of some other oil or fatty substance.

(841) J. Q.—The sample of water is probably charged with sulphate of iron from decomposition of iron deposits. We doubt if it has any value.

(842) W. H. S. asks: What chemicals, if any, mixed with water will produce a combustion or evolve gas if heated? A. Sodium in warm water will float on the surface, evolve hydrogen gas, and will catch fire and burn on the surface. It is very dangerous, generally exploding toward the close of the operation. Magnesium decomposes hot water, with evolution of

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hydrogen gas. Zinc dust in the presence of water and acid will sometimes ignite. If caustic soda or lime and water are boiled with phosphorus, phosphureted hydrogen gas is evolved, which spontaneously catches fire as each bubble escapes into the air.

(843) J. B. K.—The sample sent is crude bitumen or asphaltic deposit. It might have some value for gas making, tar roofing, or analogous uses.

(844) F. W. J. asks: 1. Is not the zinc in the Bunsen battery amalgamated? A. Yes. 2. Is the light, using a Bunsen battery, produced by heating platinum wire, or between two carbon points? A. You can make a light by heating the platinum wire by means of the current. As the platinum gives the best light when on the verge of fusion, there is great danger of fusing the wire, and it has been found impracticable to use it for this purpose. Carbon filaments are now used for incandescent lamps. With a sufficient number of cells you can produce an arc light between two carbon points. 3. What amount of gas, burning, would a sixteen candle power electric light equal? A. A 4 or 5 foot burner. 4. What would be a good design for a scarf pin, using a pocket battery, and would a silver quarter or half piece do for the silver or negative plate, and how large should the cell be to receive the carbon, silver, and solution? A. We cannot in the space at our disposal give you the information required. Consult Hospitalier's "Domestic Electricity." 5. Would it be cheaper to make the dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 161, or buy or make batteries, to produce light? I only wish to have one or two lamps. A. Probably the batteries would involve the smaller expense. You can buy the dynamo referred to for $50. If you have plenty of spare time it would be cheaper for you to make the dynamo than to buy it. 6. Which would be the cheapest for a motor, an electric motor or a water motor? A. The water motor, providing the water required to run it is not too expensive.

(845) S. K. L. asks: 1. Are type-written documents as permanently legible as those written with the inks commonly employed for pen work? A. If carbon ink is used they are more permanent than ordinary writing. If aniline inks are used they gradually fade. Carbon paper used for multiple type-written copies is often made with logwood extract and an iron salt, in which case the copy is liable to fade, but could be renewed by treatment with nutgalls solution. But a true carbon or lampblack ink is absolutely permanent. 2. If not so permanent, will you state, in a general way, how long such documents will remain legible when filed away? A. No time can be assigned. It may be several years. Much depends on the darkness of the place of deposit. 3. In the event of the ink fading, is there any method by which the writing can be restored? A. This is indicated in the first answer. For an aniline ink, nothing satisfactory can be done; for a spurious carbon ink, treatment with nutgalls may restore the writing. A true lampblack ink, such as printers use, should be employed for important work.

(846) C. B. J. asks: 1. How many pounds anthracite coal does it require to maintain steam of one horse power per hour? A. 1½ to 5 pounds, according to the economy of boiler and engine. 2. How many pounds bituminous? A. Bituminous and anthracite coal are very nearly equal for equal qualities. They both vary from 7 to 10 pounds of water evaporated per pound of coal from a temperature of 212°. 3. How many thousand feet of natural gas are equal in heat-creating power to one ton anthracite coal? A. About 40,000 cubic feet. See "American Steam Engineer" by Edwards, for table of values for various kinds of anthracite and bituminous coals and steam engine practice. We can mail it for $2.50.

(847) A. W. H. asks (1) how to hone a hollow ground razor, and keep it in good cutting order. A. You cannot make a poor razor keep its edge. Proper stropping each time is the only way to keep it in cutting order. Honing should be the exception, only done when the edge gets thick from stropping. 2. How to measure the pitch of a screw propeller wheel. A. To get the pitch of the screw, take the angle of the outer edge of the blade with the shaft axis. Multiply the diameter by 3,141 and lay this off in some convenient scale, say 1 inch to 1 foot, and raise a perpendicular line to represent the shaft axis. From the distance of the measurement of the circumference draw a diagonal line at the angle found on the blade. The perpendicular distance of intersection is the pitch.

(848) A. G. L. writes: I have a fine flute the ivory head of which is cracked its full length, leaving an opening of about one-fiftieth of an inch, which I desire to mend so as to be as nearly invisible as possible. Can I cement it together, and if so, what cement should be used, or must the crack be filled? What substance could be used for filling which would not discolor and would resemble the ivory? A. The flute head is supposed to be lined with a brass tube. The shrinkage of the ivory has caused the crack. You cannot close the crack nor cement it in a satisfactory manner. It may be filled with chalk made into a putty with mucilage or white glue. Magnesia and zinc white also makes a good putty for ivory cracks. Use as little mucilage or glue as possible in the putty.

(849) E. H. C.—The lenses of large telescopes should never be exposed to gather dust or moisture when not in use. The fouling of the surface while in use is very gradual, and should not be removed until found necessary by the thickening of the image of a star, when a soft clean linen handkerchief will readily remove the film by first breathing upon the glass and quickly and lightly wiping. No polishing material of any kind should ever be used by any but an expert or the maker.

(850) T. McC.—Pearl shell for inlaying should be sawed into pieces of the proper size for use, when the back can be split off or ground off on a stone, or the shell can be fastened to a block and the outside cut off with a sharp hard chisel and mallet.

(851) T. G. B.—1. The sandstone drillings are a very pure quartz. 2. The fossil is a shark's tooth. 3. The other sample is probably a quartzite or flint rock.

(852) A. C. S. asks: 1. Is it the electric arc or combustion of the heated ends that destroys carbons used in arc lamps? A. It is principally combustion of the carbon. 2. Can the electric arc be established between two diamonds? If so, how will they be affected by the arc? A. Diamonds are burned and vaporized in the electric arc. They will not act as arc electrodes because they are very poor conductors.

(853) G. E. asks: Which will deposit the most copper within a given time, a current of 10 amperes and 4 volts pressure or a current of 4 amperes with 4 volts pressure? A. The 10 ampere current will deposit most copper.

(854) E. D. P. asks if there is a preparation that can be put into stumps to keep them from sprouting and cause them to decay quickly. A. Bore a hole in the top and pour in a little nitric acid.

(855) N. L. R.—We do not advise you to equip a birch canoe with power. Boat propulsion by voltaic battery is not yet a success. Storage batteries have done fairly, but require an electric plant for renewal, which is not always convenient. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 430, 563, 623, 674.

(856) J. W. V. asks the best style of burners for melting steel in crucibles, and which makes the hottest fire, compressed air and oil, or steam and oil? A. The combined steam, oil, and air jet seems by late experiments to give the best results. You will find petroleum burners illustrated in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 623, 624, 592.

(857) H. J. B. writes: I wish to lay a water pipe from a spring a distance off. Will it be necessary to start with a large pipe at the head and taper smaller at other end, or will pipe the same size do all of the way? A. Lay one sized pipe the whole distance, unless there is a high head, say 100 feet, when economical practice suggests a larger pipe for the upper portion.

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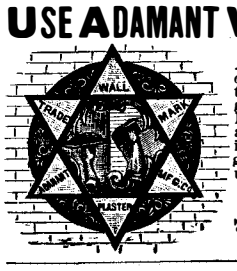

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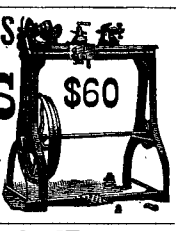

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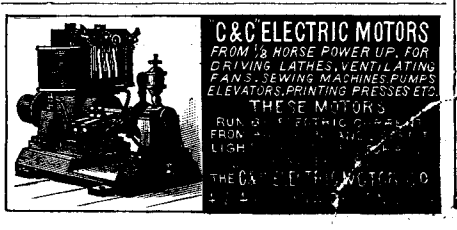
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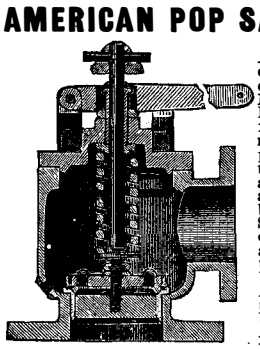

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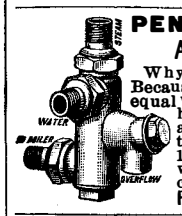

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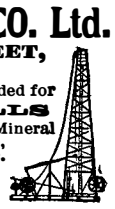

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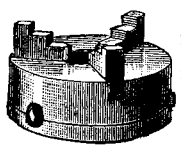

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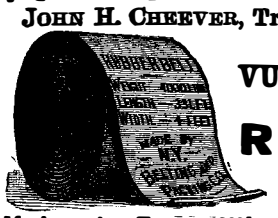

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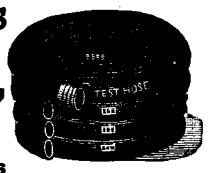

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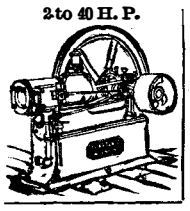

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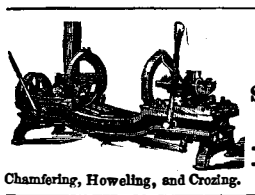

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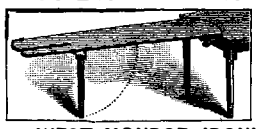

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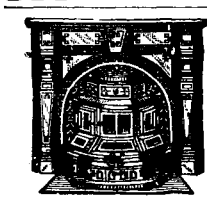

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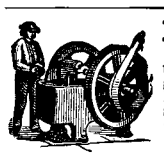

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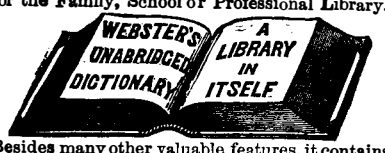

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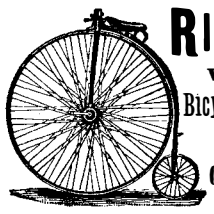

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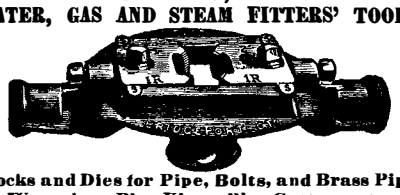

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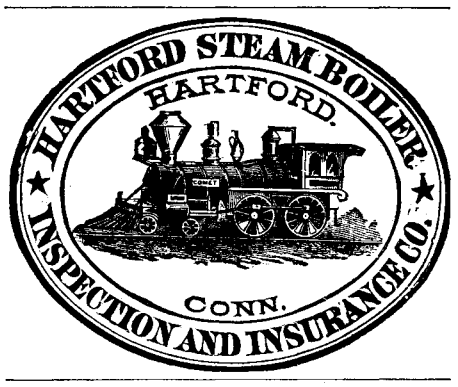

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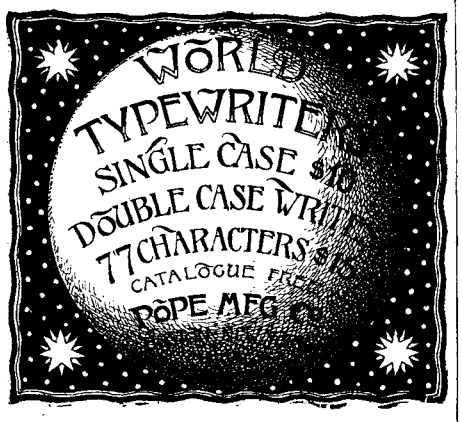

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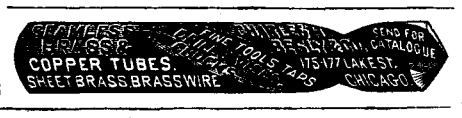

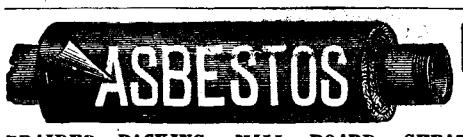

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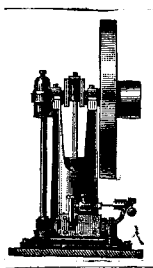

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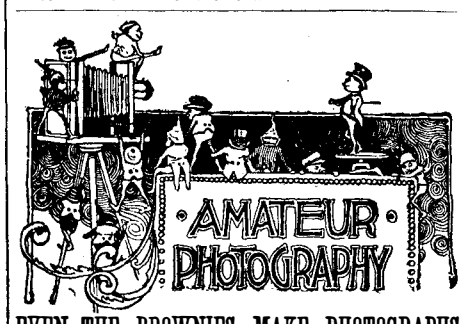

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